GAMATRONIC ELECTRONIC INDUSTRIES LTD

POWER+ SA

DOUBLE CONVERSION UPS

TRUE ON-LINE BATTERY

10 kVA, 3x208 V

User Guide

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TABLE OF CONTENTS

1. SAFETY PRECAUTIONS 1
1.1 Do's 1
1.2 Don'ts 3
2. GENERAL FEATURES 6
2.1 Major Subsystems 7
2.1.1 Charger 7
2.1.2 Batteries 7
2.1.3 Inverter 7
2.1.4 Static Switch (ST.SW. BYPASS) 7
2.1.5 Control System 8
2.2 Control Panel 8
2.3 Power-On Self Tests 9
2.4 Measurement 9
2.5 Real Time 9
2.6 Log 10
2.7 Battery Check 10
2.8 Connections 10
2.9 UPS Communications (optional) 10
3. OPERATING MODES 11
3.1 Normal Mode 11
3.2 Battery Mode 12
3.3 Bypass Mode 13
4. USER INTERFACE 14
4.1 Control Panel 14
4.2 The *POWER + SA* Display Screen 16
4.2.1 The Main Screen 16
4.2.2 Status Screens 25
4.2.3 The *POWER + SA* Main Menu 31
5. DAILY OPERATION 33
6. THE EVENT LOG 35
7. BATTERY TESTS 42
8. FIRST-TIME SETUP 43
8.1 Cable Connections 43
8.2 Installation and Start-Up Sequence 44
9. SETTING SYSTEM PARAMETERS 46
9.1 Setting the system clock 46
9.2 Setting screen contrast 47
9.3 Modifying the output ac voltage 48
9.3.1 To change the nominal output ac voltage: 48
9.3.2 To adjust (fine tune) the ac output voltage 49
9.4 Setting the dc voltage 50
10. BYPASS OPTION ACTIVATION / DEACTIVATION 52
11. AUTOMATIC RESTART 54
12. MISCELLANEOUS FUNCTIONS 56
13. IN THE EVENT OF AN AC POWER OUTAGE 58
14. TROUBLESHOOTING 61
15. INSTALLATION AND SETUP 62
15.1 External Inspection 62
15.2 Site Preparations 62

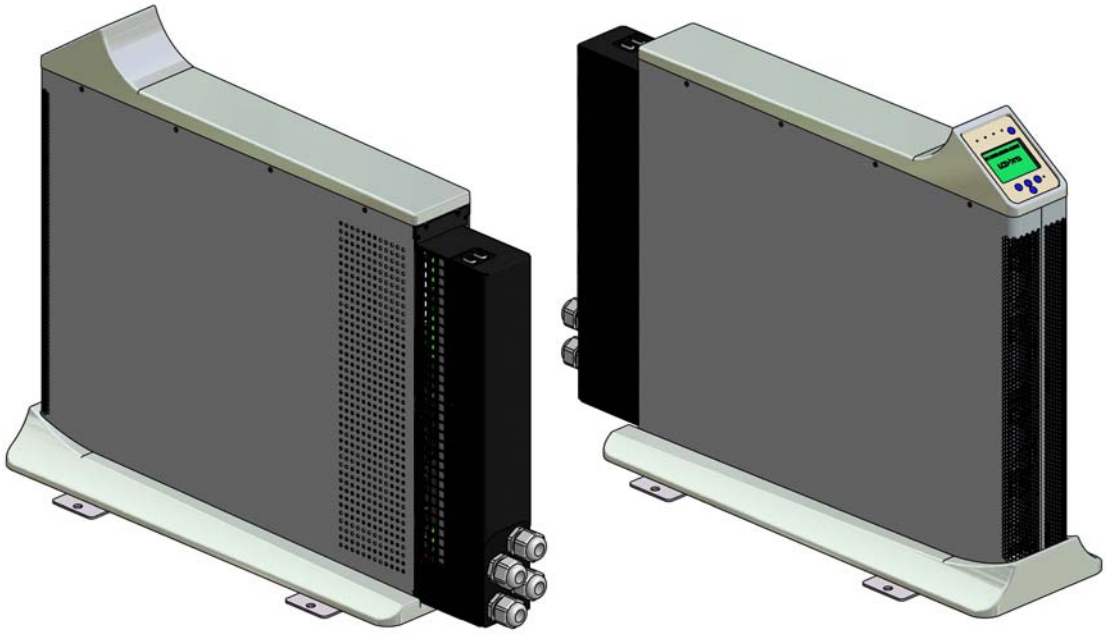
15.2.1 Installation Considerations 63
15.2.2 Equipment Location 63
15.2.3 Site Connection Diagram 63
15.2.4 Electrical Wiring 64
15.3 Installation Process 65
15.3.1 Safety guidelines 65
15.3.2 Installing the *POWER + SA* 66
15.3.3 Battery installation 69
15.4 Verifications Prior to First-Time Operation 71
15.5 First-Time Startup and Verification Test: 72
16. ALARM DRY CONTACTS 74
17. RS232 INTERFACE 76
18. SNMP AGENT (OPTIONAL) 77
19. WIRELESS CONTROL (OPTIONAL) 78
20. CONFIGURING THE *POWER+ SA* FOR 2- AND 3-PHASE USAGE 81
20.1 Input and output wiring for two-phase operation 83
20.1.1 Installing the *POWER + SA* for 2-phase usage 84
21. *POWER+ SA* SPECIFICATIONS 87

LIST OF FIGURES

Figure 2-1: Block Diagram of the POWER+ UPS 6
Figure 2-2: Control Panel 8
Figure 2-3: The LCD screen displays real-time readings 9
Figure 3-1: Normal Mode display 11
Figure 3-2: Battery Mode display 12
Figure 3-3: Bypass Mode display 13
Figure 4-1: The POWER+ SA control panel 14
Figure 4-2: UPS on, Normal mode 17
Figure 4-3: Battery test failure 17
Figure 15-1: Site connection block diagram 63
Figure 15-2: UPS rear panel with protective cover 66
Figure 15-3: UPS rear panel view, with protective cover removed 67
Figure 15-4: Batterybox - front right view 69
***Figure 15-5: Battery box - front view* 69**
***Figure 15-6: Battery box, front view, front cover removed* 69**
Figure 15-7: Battery box circuit breaker and terminals 70
Figure 15-8: Battery terminals on the POWER + SA rear panel 70
***Figure 19-1: WING General Block Diagram* 78**
Figure 20-1: Wiring diagram 81
Figure 20-2: Wiring overview for symmetrical 2-phase operation 83
Figure 20-3: UPS rear panel with protective cover 84
Figure 20-4: UPS rear panel view, with protective cover removed 85

LIST OF TABLES

Table 4-1: Main Menu options....32
Table 15-1: Electrical ratings and external wiring requirements....64
Table 15-2: Required wire ratings....64
Table 15-3: UL-required circuit breaker ratings....64
Table 20-1: 2- and 3-phase configuration – electrical details....81



The POWER+ STAND-ALONE UPS

1. SAFETY PRECAUTIONS

The ***POWER+ SA*** UPS system is designed for industrial applications and harsh environments. Nevertheless the ***POWER+ SA*** UPS system is a sophisticated power system and should be handled with appropriate care, following these guidelines.

1.1 Do's

- Read this manual carefully before starting installation and operation of the UPS.
- Review the safety precautions described below to avoid injury to users or damaging equipment.
- All power connections must be completed by a licensed electrician who is experienced in wiring this type of equipment, and who is knowledgeable about all federal, state, and local electrical codes and regulations. **Improper wiring may cause damage to the equipment or injury to personnel.**
- Pay attention to the warning signs, labels and marks on the unit. A warning sign signals the presence of a possibly serious, life-threatening condition.
- Keep the surroundings clean, uncluttered and free from excess moisture.
- Allow only qualified technicians to service the UPS. There are no user-serviceable components. **Do not try to repair it yourself!**
- Use the UPS only for its intended purpose.

WARNING! - ENERGIZED CIRCUITS DURING SERVICING:

The electronic boards and the control panel circuits remain energized during servicing procedures. Take appropriate precautions!

CAUTION - WARNING - RISK OF LETHAL ELECTRIC SHOCK:

The battery drawer contains a series of 12-Volt batteries that provide high voltage and energy in the UPS body even when the UPS is not connected to the ac input. Appropriate precautions should be taken during installation, inspection and servicing.

CAUTION - WARNING - RISK OF LETHAL ELECTRIC SHOCK:

The UPS receives power from more than one source. Disconnection of all of the ac sources and the dc source is required to de-energize this unit before servicing.

AVERTISSEMENT ! - CIRCUITS ACTIVÉS PENDANT L'ENTRETIEN :

Les panneaux électroniques et les circuits de panneau de commande demeurent activés pendant des procédures de service.

Précautions appropriées de prise!

ATTENTION - AVERTISSEMENT - RISQUE DE DÉCHARGE ÉLECTRIQUE MORTELLE :

Le tiroir de batterie contient une série de batteries 12-Volt qui fournissent la haute tension et l'énergie dans le corps D'UPS même lorsque L'UPS n'est pas relié à l'entrée à A.C. Des précautions appropriées devraient être prises pendant l'installation, l'inspection et l'entretien.

ATTENTION - AVERTISSEMENT - RISQUE DE DÉCHARGE ÉLECTRIQUE MORTELLE :

L'UPS reçoit la puissance de plus d'une source. Le débranchage de toutes les sources à A.C. et source de D.C est exigé pour désactiver cette unité avant l'entretien.

1.2 Don'ts

- Do not open the cover of the UPS or the battery cabinets under any circumstances. All UPS panels and doors should be closed.
- Do not insert any objects through the ventilation holes.
- Do not put objects on the UPS.
- Do not move the UPS while it is operating.
- Do not use the UPS outdoors.
- Do not turn the UPS upside down during transportation.
- Do not connect or disconnect the cable to the battery cabinet before the battery circuit breaker is turned OFF.
- Do not turn ON the battery circuit breaker when the battery cabinet is disconnected from the UPS.
- Do not install next to any gas or electrical heaters. A restricted location is recommended in order to prevent access by unauthorized personnel.

CAUTION – GROUND CONNECTION ESSENTIAL BEFORE CONNECTING SUPPLY

Connect the UPS to ground before connecting it to the ac supply.

CAUTION - WARNING - RISK OF ELECTRIC SHOCK! DO NOT REMOVE COVER!

Do not remove the UPS cover. There are no user serviceable parts inside. Refer servicing to qualified service personnel.

CAUTION - WARNING - RISK OF ELECTRIC SHOCK!

Attention service personnel: Capacitors store hazardous energy. Do not remove cover until 5 minutes after disconnecting all ac and dc sources of supply. Do not remove the UPS cover. There are no user serviceable parts inside. Refer servicing to qualified service personnel.

ATTENTION - la PRISE DE TERRE AU SOL ESSENTIELLE AVANT DE RELIER L'APPROVISIONNEMENT

Mettre L'UPS à la terre avant de le relier à l'approvisionnement à A.C.

ATTENTION - AVERTISSEMENT - RISQUE DE DÉCHARGE ÉLECTRIQUE ! N'ENLEVEZ PAS LA COUVERTURE !

N'enlevez pas la couverture D'UPS. Il n'y a aucune pièce utile d'utilisateur à l'intérieur. Référez-vous l'entretien au personnel de service qualifié.

ATTENTION - AVERTISSEMENT - RISQUE DE DÉCHARGE ÉLECTRIQUE !

Personnel de service d'attention : Énergie dangereuse de mémoire à condensateur. N'enlevez pas la couverture jusque à 5 minutes après avoir débranché toutes les sources à A.C. et de D.C d'approvisionnement. N'enlevez pas la couverture D'UPS. Il n'y a aucune pièce utile d'utilisateur à l'intérieur. Référez-vous l'entretien au personnel de service qualifié.

WARNING: RISK OF SEVERE DAMAGE TO THE UPS!!!

THIS SYSTEM USES THE NEUTRAL LINE FOR OPERATION. THEREFORE, IT IS STRICTLY FORBIDDEN TO CONNECT THIS SYSTEM TO THE AC POWER SOURCE WITHOUT A NEUTRAL (NULL) CONDUCTOR!!

FAILURE TO USE A NEUTRAL CONDUCTOR MAY CAUSE PERMANENT DAMAGE TO THE SYSTEM.

AVERTISSEMENT : RISQUE DE DOMMAGES GRAVES À L'UPS ! ! !

CE SYSTÈME EMPLOIE LA LIGNE NEUTRE POUR L'OPÉRATION. PAR CONSÉQUENT, ON INTERDIT STRICTEMENT DE RELIER CE SYSTÈME A LA SOURCE (AC) DE COURANT ALTERNATIF SANS CONDUCTEUR (NUL) NEUTRE ! !

L'ÉCHEC À L'UTILISATION D'UN CONDUCTEUR NEUTRE PEUT ENDOMMAGER EN PERMANENCE LE SYSTÈME.

RECYCLING INFORMATION

Consult your local recycling or hazardous waste center for information on proper disposal of a used battery or UPS.

WARNING

Do not dispose of batteries in a fire. Batteries may explode. Consult with your local recycling / hazardous waste center for disposal requirements.

CAUTION

Do not discard the UPS or its batteries in the trash. This product contains sealed lead-acid batteries . For proper disposal, contact your local recycling / hazardous waste center.

CAUTION

Do not discard waste electrical or electronic equipment (WEEE) in the trash. For proper disposal, contact your local recycling / hazardous waste center.

2. GENERAL FEATURES

The ***Power + SA*** Uninterruptible Power Supply (UPS) employs Pulse Width Modulation (PWM) and is controlled by a micro-controller, to provide reliable, sophisticated protection against every type of line fluctuation, including interruption of the mains (electrical) supply.

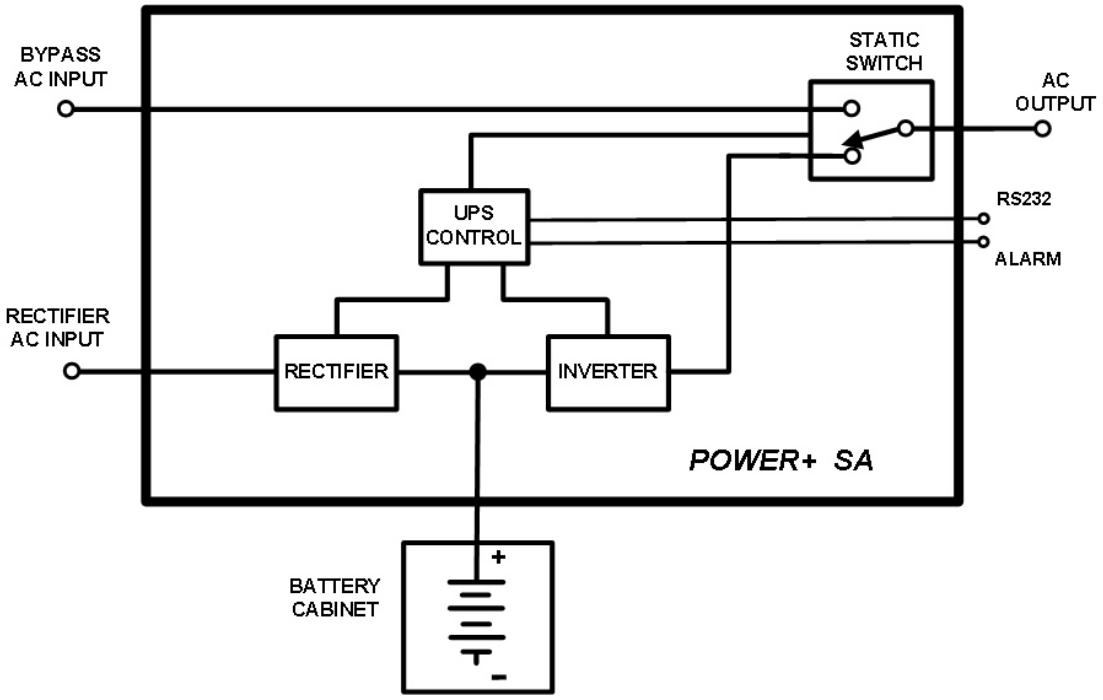


Figure 2-1: Block Diagram of the POWER+ UPS

In case of a power failure, the UPS provides backup power for a specific period.

The system is user friendly. Its operation is simple and requires no previous technical knowledge. The UPS operates on-line and, once activated, provides voltages of 3×208 Vac at a stabilized 50 or 60 Hz frequency—depending upon your configuration—to load.

When backup service is provided (upon mains power failure), the UPS is powered by batteries and maintains a constant output voltage supply. The system informs the operator, by means of LED indicators and audible signals, when a power failure occurs.

An LCD display on the UPS front panel provides complete, real time information reflecting the UPS's operational status.

Using an RS232C communications port, similar status information may be viewed on a computer.

2.1 Major Subsystems

The device consists of the following modules:

2.1.1 Charger

POWER + SA includes a 3-phase charger with PFC[1].

2.1.2 Batteries

The ***POWER + SA*** battery bank is used as a backup in the event that the utility ac input fails. The batteries are housed in an external cabinet next to the ***POWER + SA*** cabinet. Batteries are charged by the rectifier/charger, which supplies both the inverter and the battery charger.

2.1.3 Inverter

A 3-phase PWM inverter is connected to batteries by a classic dc link.

2.1.4 Static Switch (ST.SW. BYPASS)

The Static Switch enables an automatic transfer of the load from the output of the inverters to an alternate source whenever the inverter can no longer supply power to the load. The static switch transfers current at high speed.

[1] PFC is a feature included that reduces the amount of generated reactive power. Reactive power operates at right angles to true power and energizes the magnetic field. Reactive power has no real value for an electronic device, but electric companies charge for both true and reactive power resulting in unnecessary charges.
In power factor correction, the power factor (represented as "k") is the ratio of true power (kWatts) divided by reactive power (kVA). The power factor value is between 0.0 and 1.00. If the power factor is above 0.8, the device is using power efficiently. A standard power supply has a power factor of 0.70-0.75, and a power supply with PFC has a power factor of 0.95-0.99.

2.1.5 Control System

The control system performs the following functions:

- Tests input, bypass, inverter, battery voltage, output current, input/output signal frequency, and temperature.
- Manages the static switch and charger voltage during battery tests.
- Controls the ALARM interface.
- Controls the panel keyboard reading and sends messages to the front panel LCD display.
- Communicates with devices via the RS232C interface.

2.2 Control Panel

The UPS is equipped with an LCD display and touch pad control panel that enable the user to effectively manage the UPS. Once the UPS is installed, the control panel serves as the user's primary interface with the system. Messages, warnings and error conditions are relayed to the user through the control panel's LCD display and through audible alarms.

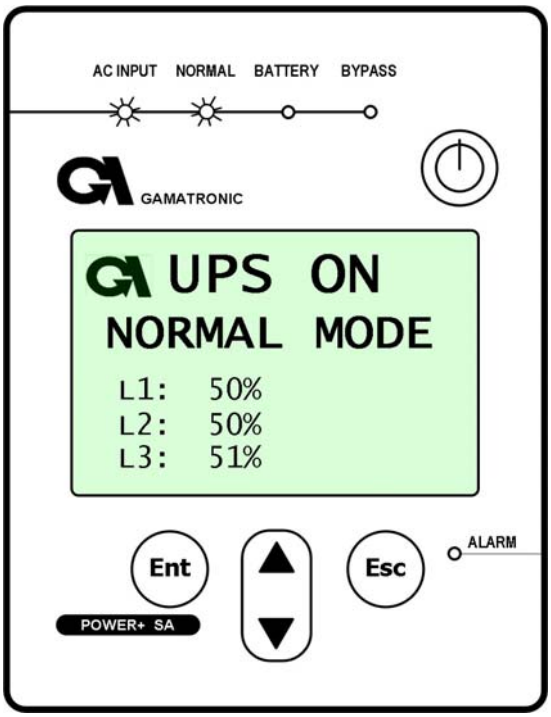


Figure 2-2: Control Panel

2.3 Power-On Self Tests

The UPS automatically performs a series of diagnostic tests when initially powered on.

2.4 Measurement

The user can receive real-time information regarding the unit's operation and condition simply by pressing the appropriate status button. The real-time results are displayed on the front panel, as shown in Figure 2-3.

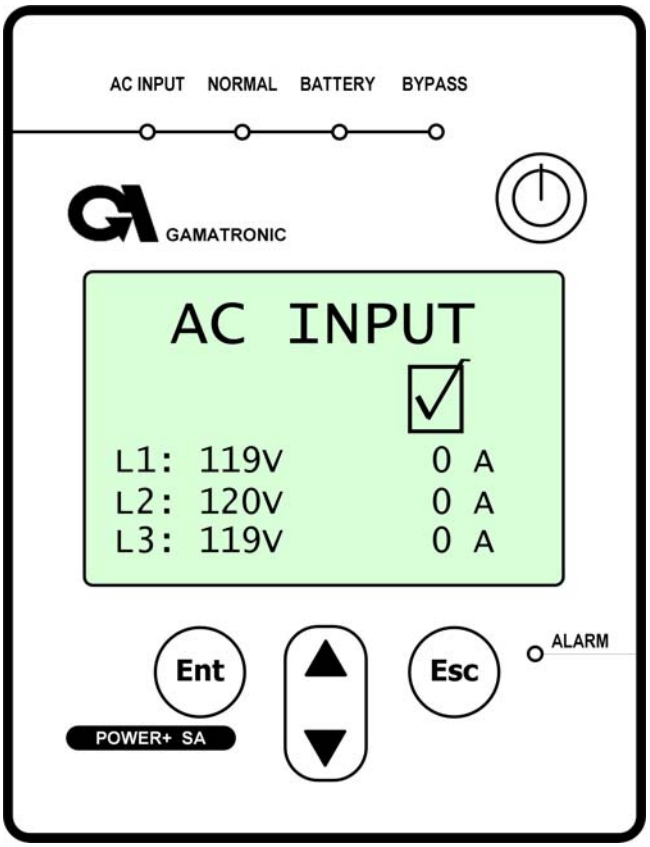


Figure 2-3: The LCD screen displays real-time readings

2.5 Real Time

The system includes a real-time clock and calendar that sequentially manage the log file and provide historical data to the user. This information is accessible via the LCD display or, optionally, through the RS232 communications port.

2.6 Log

The system compiles a listing of up to 200 extraordinary events of the mains, unit and load during operation. This data is written to the log file and can be accessed easily at any time through the display panel, computer, or via modem. This information is extremely useful for maintenance and analyzing performance statistics.

2.7 Battery Check

The unit automatically and continuously checks the battery bank connection with the UPS. The battery charge is checked automatically at user-controlled intervals, and a manual battery test can be performed at any time.

2.8 Connections

The terminal connectors are located on the rear side of the UPS and may be accessed only after removal of their protective cover with a screwdriver.

2.9 UPS Communications (optional)

The UPS relays all the measured data and events of the log file through an RS232C communications port to a host computer or, using a modem connected to a telephone line, to a remote location.

3. OPERATING MODES

The ***POWER + SA*** is installed between the power mains and your load devices, and supplies ac electrical power to your equipment. The ***POWER+ SA*** has three automatic modes of operation:

- Normal mode
- Battery mode
- Bypass mode

3.1 Normal Mode

POWER + SA almost always operates in normal mode. In normal mode the load receives its power from the inverters that supply stabilized voltage, protected from spikes and irregularities in the ac input. The ac input system feeds the charger which supplies dc power to the inverter, while concurrently charging the batteries.

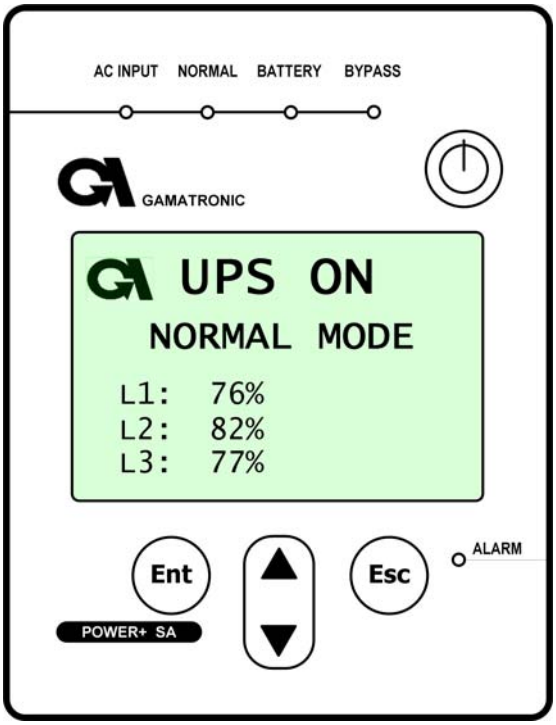


Figure 3-1: Normal Mode display

3.2 Battery Mode

If the input ac power fails or the voltage drops below an acceptable level, the UPS operates in backup mode. In backup mode the load continues to receive power from the inverters, but the dc input to the inverter is taken from the batteries, instead of from the rectifier.

The batteries are galvanically connected by dc link to the inverter and the charger. The dc inherently remains constant when the ac input supply drops out, without any switching devices.

The duration of the battery operation is determined by the load demand and battery capacity.

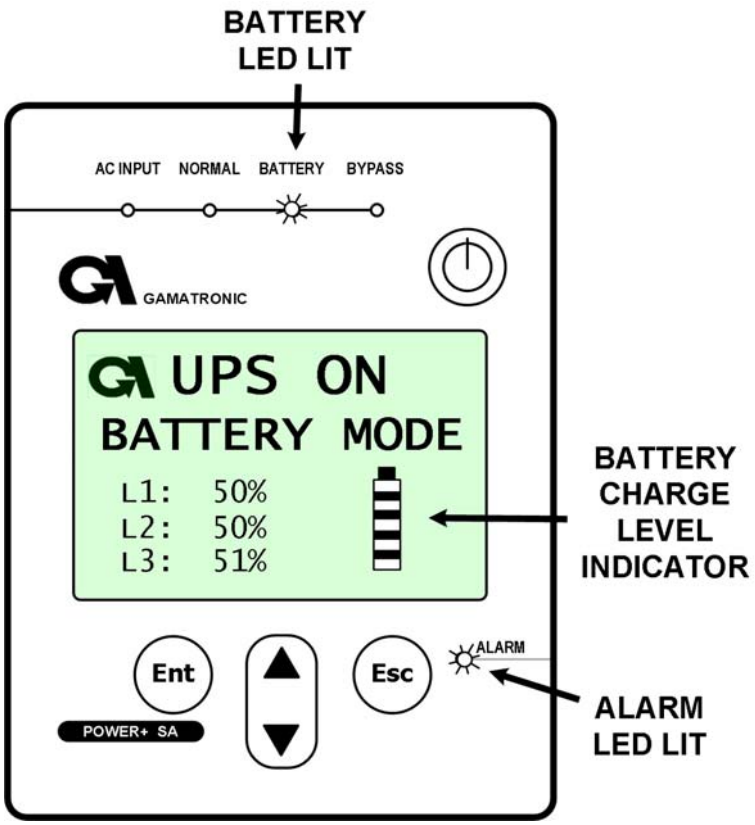


Figure 3-2: Battery Mode display

3.3 Bypass Mode

In bypass mode the load receives power directly from the ac input via the static switch.

Whenever the inverters cannot provide power to the load, for example, due to an overload or a short-circuit in the load, the UPS supplies the load directly from the ac input, bypassing the inverter. As soon as the problem is corrected, the load is transferred back to the inverter automatically.

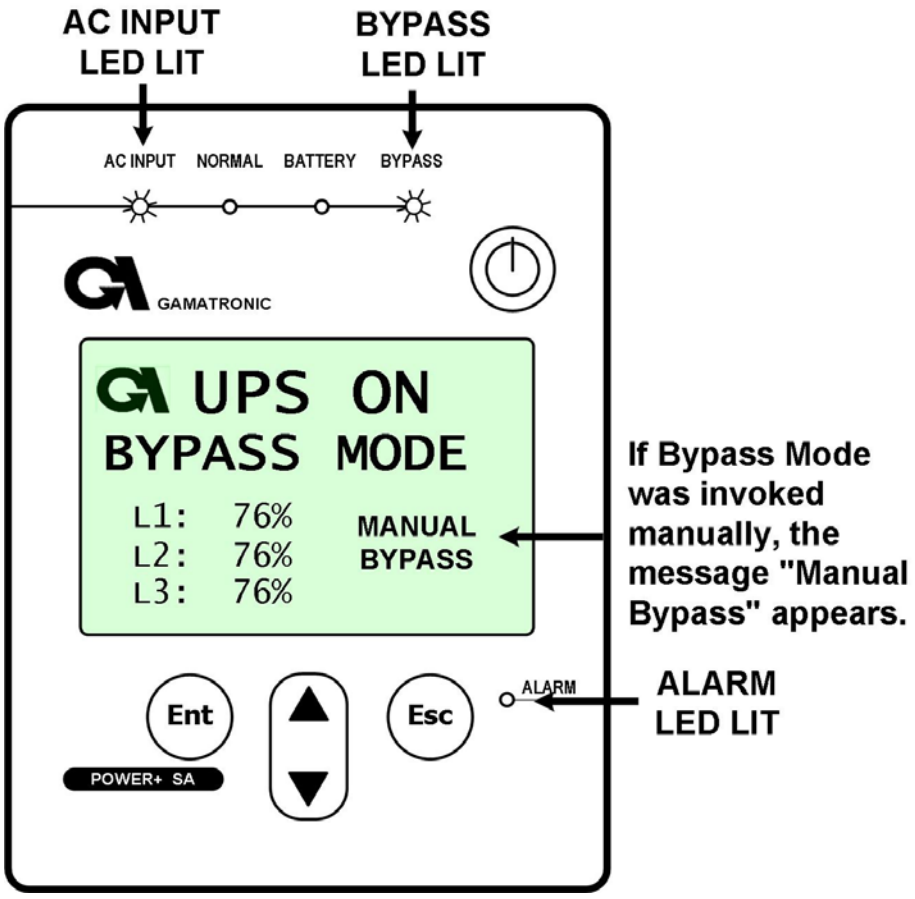


Figure 3-3: Bypass Mode display

4. USER INTERFACE

This section describes the buttons and indicators used to operate the ***POWER + SA***.

4.1 Control Panel

The ***POWER + SA*** Control Panel includes an LCD display, control buttons, and LED indicators.

The control panel has three principle functions:

- Shows the current operating mode
- Lets you display other current readings
- Lets you modify UPS settings and operating mode

The control panel is for use by the end-user and the service technician.

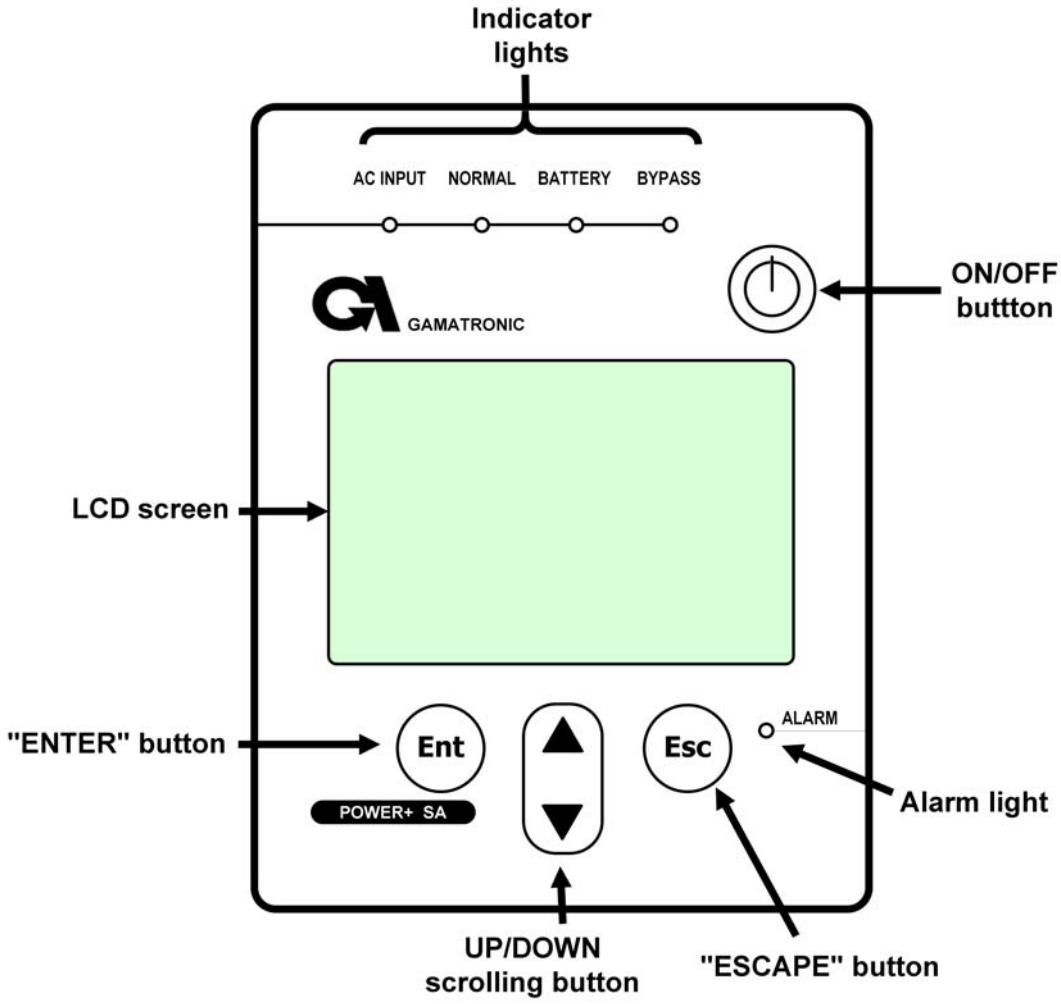


*Figure 4-1: The **POWER+ SA** control panel*

On/Off Button

To turn the UPS on, press the button twice.

To turn the UPS off, press the button twice.

Navigation Keypad

The control panel's keypad consists of three buttons.

- The **UP/DOWN** key is used to navigate through screens and browse the Event Log.
- The **Ent** (Enter) key is used to select an item or apply a change.
- The **Esc** (Escape) key returns you to the Main Screen.
  During an active alarm condition, pressing the **Esc** button from the Main Screen silences the audible alarm.

Indicators

The top of the control panel contains four LCD indicators. The status indicators show what is running and how the UPS is providing power to the load.

The table shows the color and meaning of the LCD status indicators when lit.

AC INPUT	**Green** – Ac input is present and within normal range.
NORMAL	**Green** – The UPS is in normal mode.
BATTERY	**Yellow** – The UPS is in Battery mode
BYPASS	**Yellow** – The UPS is in Bypass mode
ALARM	**Red** – Indicates an alarm condition. To determine the nature of the alarm: From the Main Screen press **Ent** to display the main menu, press **Ent** again to see the Alarm Status, press **Ent** once more to see the Event Log.

4.2 The *POWER + SA* Display Screen

The display screen on the ***POWER + SA*** control panel shows the current operating mode and related critical data. There are several distinct data screens that can be shown on the ***POWER + SA*** display screen.

4.2.1 The Main Screen

The ***POWER + SA*** Main Screen is the default display on the ***POWER + SA*** screen. From any other screen, if the keyboard is not used for 45 seconds, the ***POWER + SA*** returns to the Main Screen.

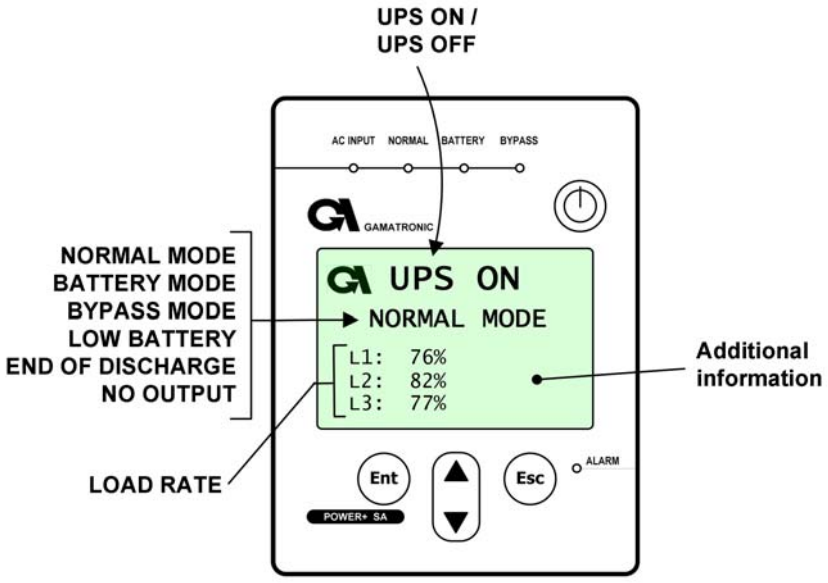
The Main Screen shows the UPS's current operating mode and other critical data.

Other screens describing current operating conditions can be seen by navigating "upwards" or "downward" with the UP/DOWN key.

The first line of the Main Screen shows whether the UPS is currently on or off. The second line tells you the most important information about the UPS's current status. Most of the time it will read "NORMAL MODE". The UPS can also automatically transfer to:

- BATTERY MODE
- BYPASS MODE
- UPS OFF

The L1, L2, and L3 numbers in the Main Screen show the current load rate as a percent of maximal ac load at each phase.



NORMAL MODE

In Normal mode, the Main Screen displays the message:
UPS ON, NORMAL MODE. The AC INPUT and NORMAL LEDs are lit.

shows the Main Screen as you will see it most of the time, in Normal Mode.

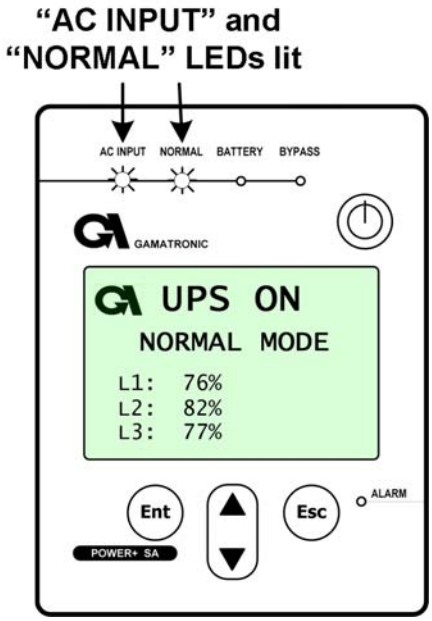


Figure 4-2: UPS on, Normal mode

In the event of a battery test failure, an icon indicating this appears in the lower right quadrant of the screen, the alarm LED lights, and the audible alarm sounds.

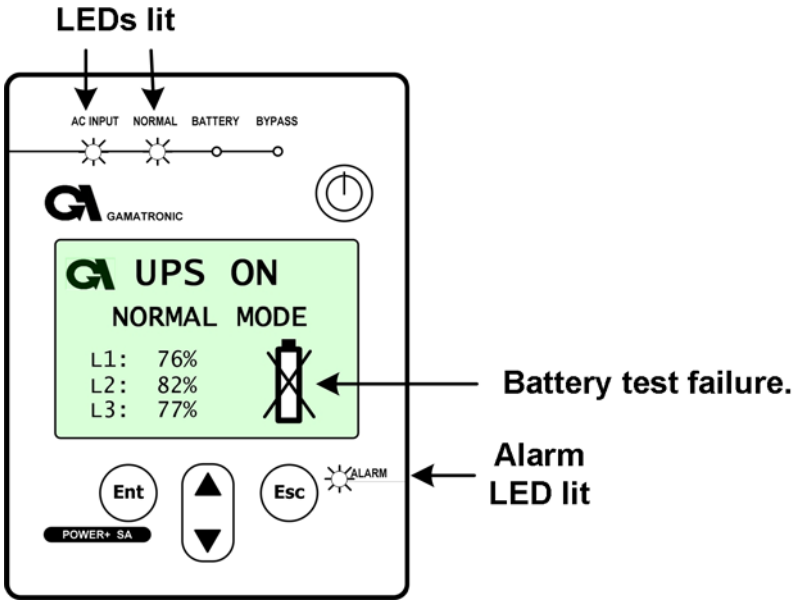
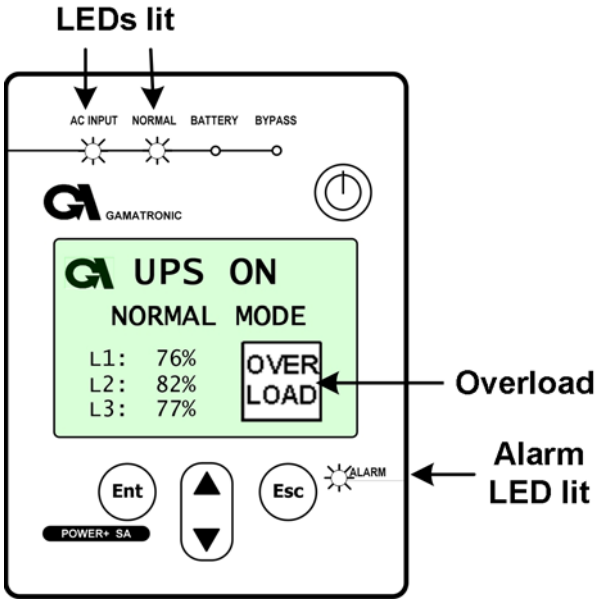


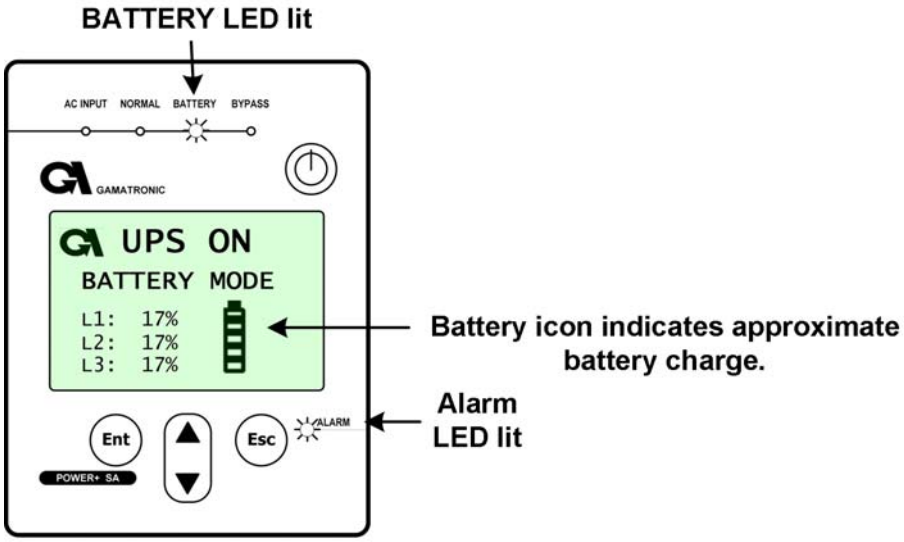
Figure 4-3: Battery test failure

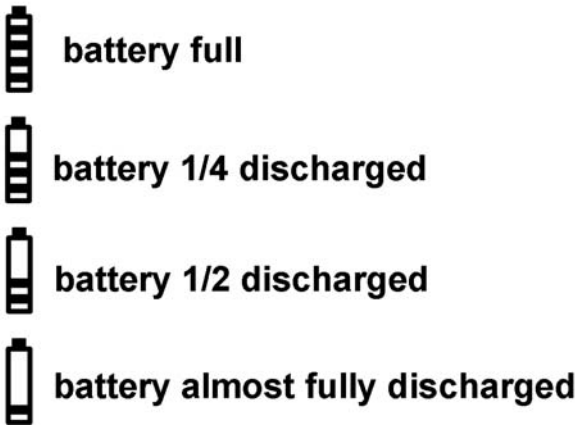
In the event of an overload condition, an icon indicating this appears in the lower right quadrant of the Main Screen, the alarm LED ligits, and the audible alarm sounds.



BATTERY MODE

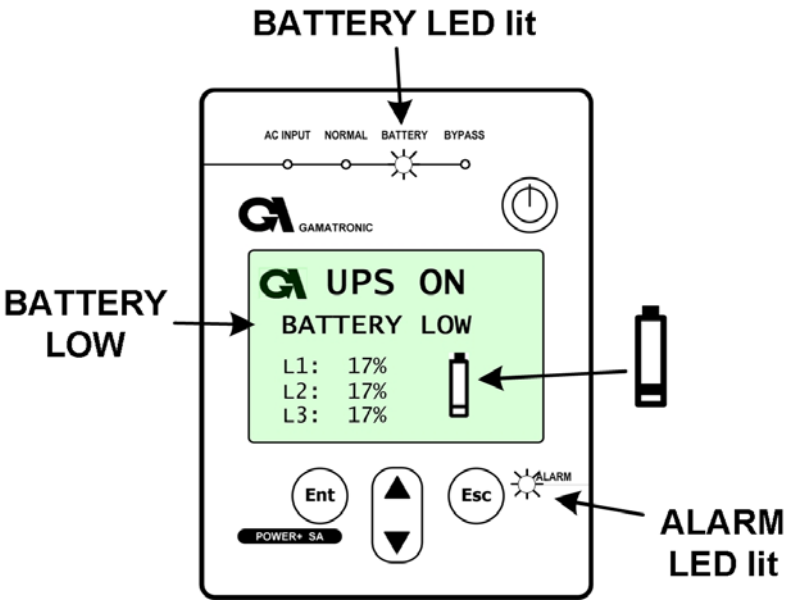
When the UPS is operating in battery mode, the Main Screen first displays the message: UPS ON, BATTERY MODE.





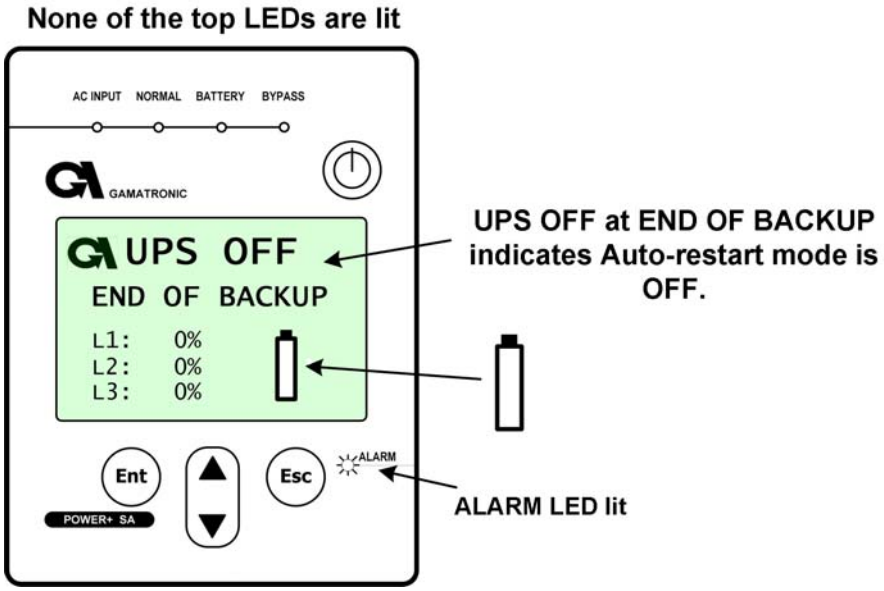
As the battery discharges, the number of “stripes” on the battery icon decreases.

When the "BATTERY LOW" message appears, there are only a few seconds before the battery is exhausted. To avoid losing information, you should at this time save your data and perform an orderly shutdown of any computers connected to the UPS, if you have not already done so.

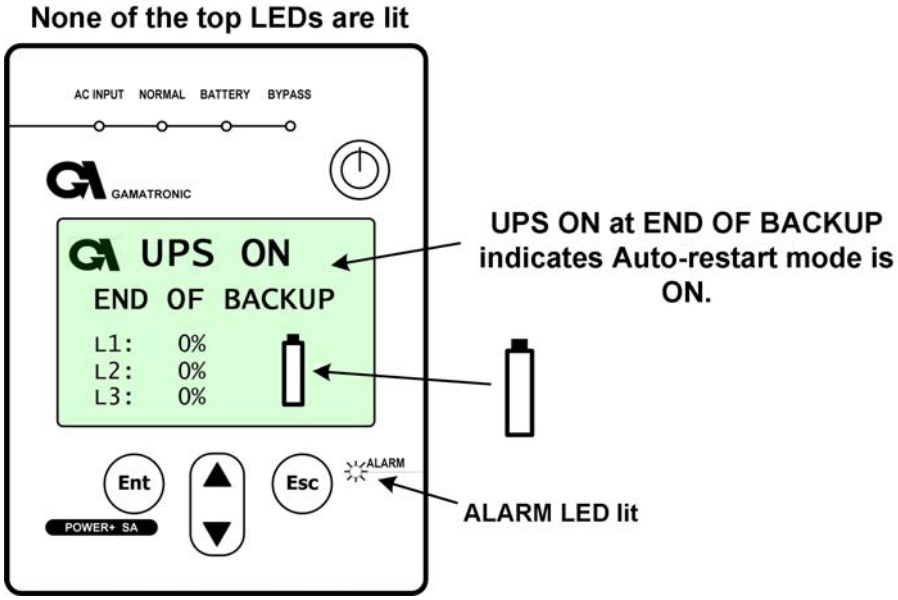


When the UPS battery is exhausted, the UPS does one of two things, depending on the setting of *auto-restart* mode:

- When auto-restart is DISABLED, the UPS shuts off and remains off, even when ac power is restored. When ac power is restored you must press the OFF/ON button twice to turn on the UPS.



- When auto-restart is ENABLED, the Main Screen shows the UPS ON message. When ac power is restored, the UPS starts up automatically.

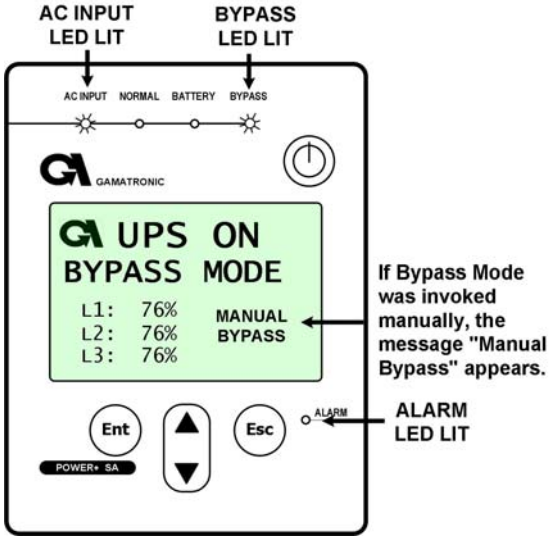


BYPASS MODE

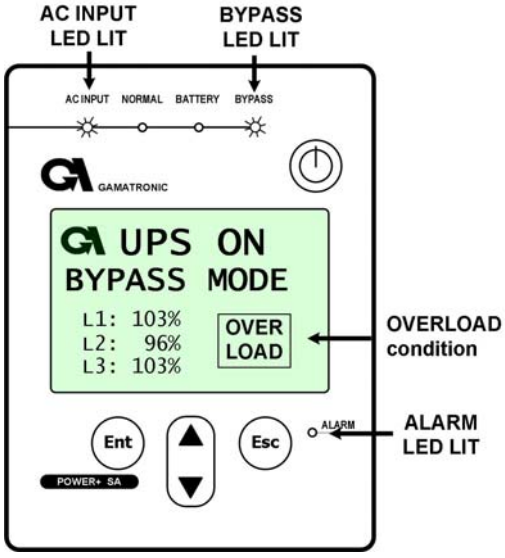
In Bypass mode, the Main Screen displays the message:
UPS ON, BYPASS MODE. The AC INPUT*, BYPASS, and ALARM LEDs are lit. After 60 seconds in Bypass Mode the audible alarm sounds.

The UPS goes into bypass mode automatically in the case of an overload or if there is an inverter fault. Bypass mode can also be invoked manually.

If the UPS was put in Bypass mode manually, the message “Manual Bypass” appears on the screen.



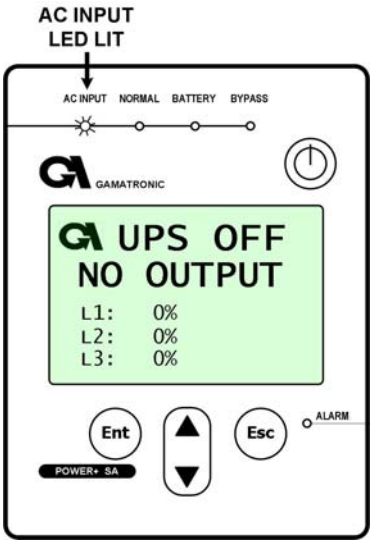
When an overload condition occurs, the UPS moves to Bypass mode until the overload is resolved.



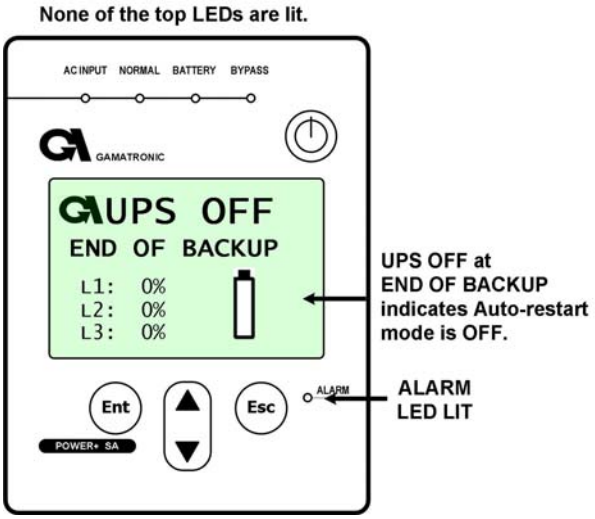
* If the UPS went to bypass mode due to a failure of the AC input, and the bypass input is still live, the AC Input LED will not be lit at this time.

UPS OFF

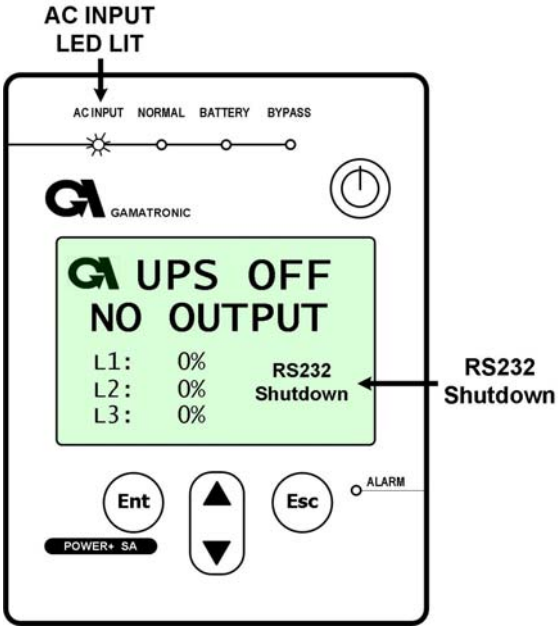
Off mode is invoked by pressing the On/Off button twice when the UPS is operating. The Off screen displays the message: UPS OFF, NO OUTPUT.



Off mode can also be invoked automatically in the event of an extended ac power outage, if auto-restart is disabled.



Off mode can also be invoked remotely, through the RS232 data connection.



4.2.2 Status Screens

From the Main Screen, by means of the button, you can access several screens that provide current UPS status information:

- UPS Profile screen
- Ac Output screen
- Ac Input screen
- Bypass screen
- Inverter screen
- Battery screen

UPS PROFILE SCREENS

To see the UPS Profile screens, from the Main Screen, press ▼ once.

There are three UPS Profile screens. The first UPS Profile screen shows:

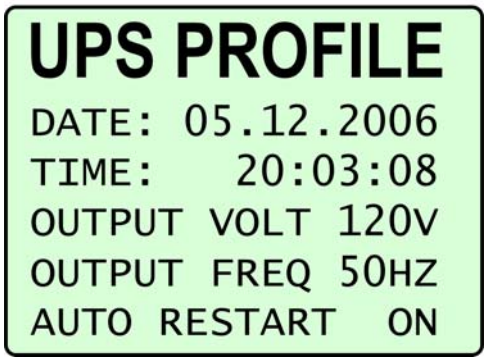
- Current date according to the UPS's clock (DD.MM.YYYY)
- Current time according to the UPS's clock (HH:MM:SS).
  See section 9.1 for instructions on setting the system clock.
- Nominal output voltage
- Nominal output frequency
- Auto-restart status (ON or OFF).
  See chapter 11 for information about the Auto Restart feature.

To see the second UPS Profile screen, press ▼ again. The second UPS Profile screen shows:

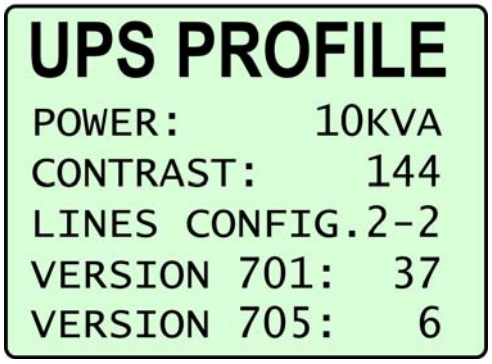
- The software version on card PC705.
- The software version on card PC701.
- Current contrast setting of the display screen (see section 9.2 on for information on the contrast setting).

To see the third UPS Profile screen, press ▼ again. The third UPS Profile screen shows:

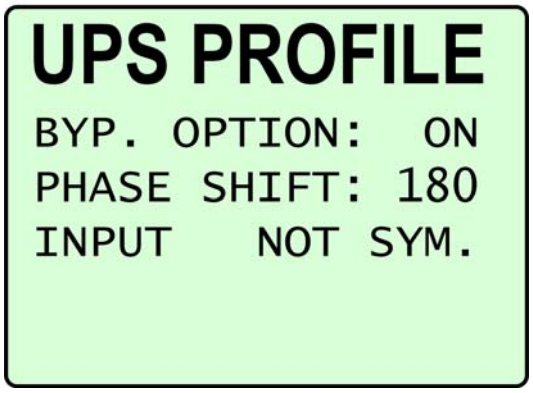
- The status of the Bypass option: ON or OFF.
- The phase shift between the output phases.
- Whether the current in the input phases is symmetric (equal) or unsymmetric (unequal).



UPS Profile screen 1



UPS Profile screen 2



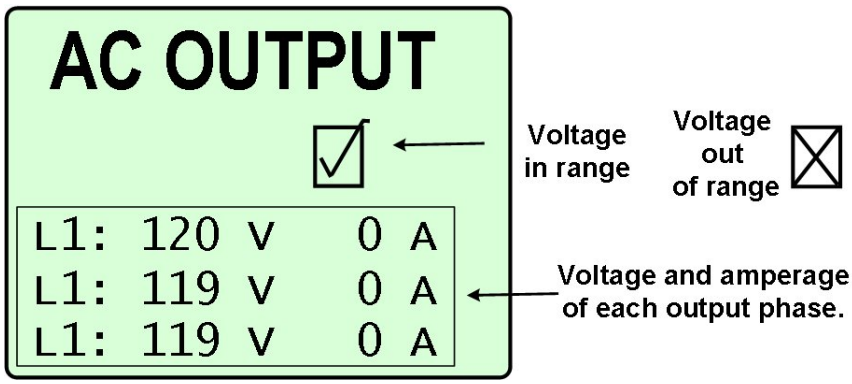
UPS Profile screen 3

AC OUTPUT SCREEN

To see the current status of the UPS's ac output, from the Main Screen, press ▼ twice.

The checkmark indicates that the ac voltage of each output phase is within acceptable range; otherwise an "**X**" is displayed instead of the checkmark.

The voltage and current for the three output phases is also displayed.

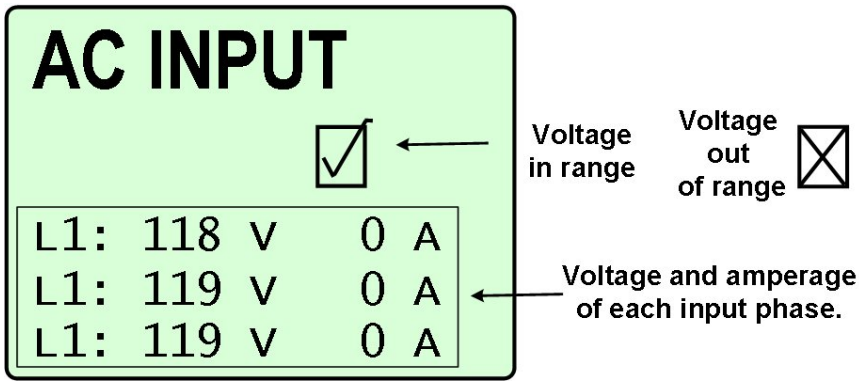


AC INPUT SCREEN

To see the current status of the ac input to the UPS, from the Main Screen, press ▼ three times.

The checkmark indicates that the ac voltage of each input phase is within an acceptable range; otherwise an "**X**" is displayed instead of the checkmark.

The voltage and current for the three input phases is displayed.

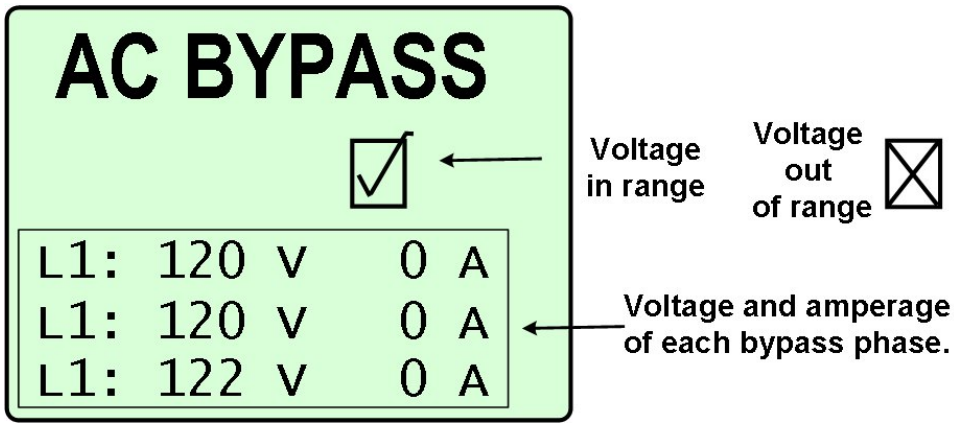


BYPASS SCREEN

To see the current status of the Bypass, from the Main Screen, press ▼ four times.

The checkmark indicates that the voltage of all three phases at the Bypass Switch is within an acceptable range. If the voltage of any of the phases is out of range, an **X** is displayed instead of the checkmark.

The voltage and current for the three Bypass phases is also displayed.



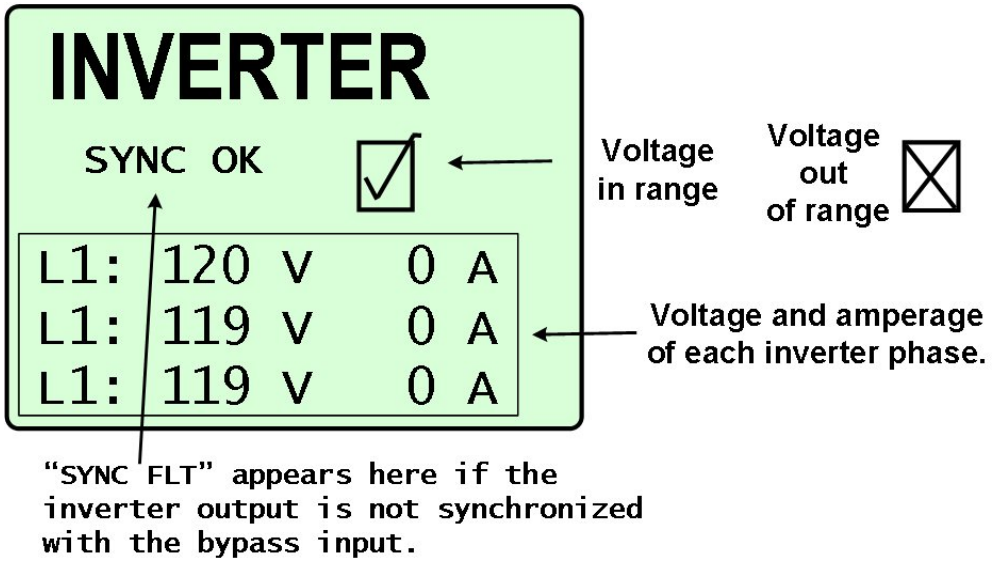
INVERTER SCREEN

To display the current status of the inverter, from the Main Screen, press ▼ five times.

If the inverter output is phase-synchronized with the Bypass input, the message SYNC OK is shown; otherwise, SYNC FLT (synch fault) appears.

The checkmark indicates that the voltage of all three phases of the inverter output is within an acceptable range. If the voltage of any of the phases is out of range, an **X** is displayed instead of the checkmark.

The output voltage and current for each inverter phase is also displayed.


INVERTER
SYNC OK
Voltage in range
Voltage out of range
L1: 120 V 0 A
L1: 119 V 0 A
L1: 119 V 0 A
Voltage and amperage of each inverter phase.
"SYNC FLT" appears here if the inverter output is not synchronized with the bypass input.

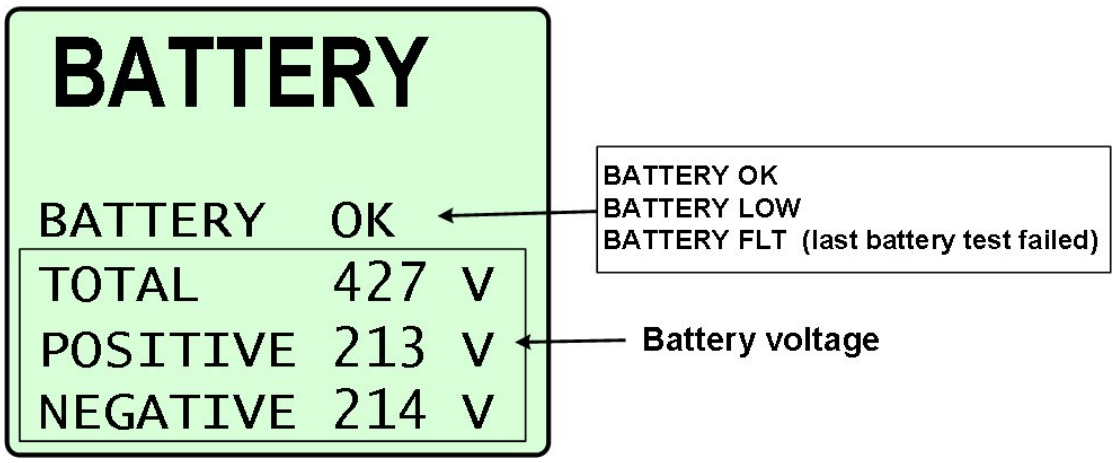
BATTERY SCREEN

To see the current battery status and voltages, from the Main Screen, press ▼ six times.

The battery status can be:

- BATTERY OK,
- BATTERY LOW, or
- BATTERY FLT (means the battery failed the latest battery test).

The battery's positive, negative, and total voltage is also displayed.

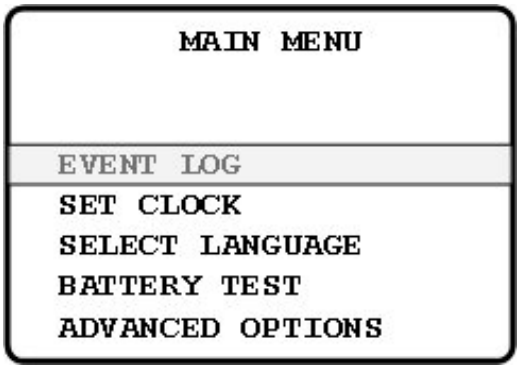


4.2.3 The *POWER + SA* Main Menu

Through the use of the control panel buttons, the user can:

- Modify UPS settings,
- Perform a manual battery test,
- Move the UPS to bypass mode or back to inverter mode,
- View current alarms,
- View the event history.

The Main Menu is your point of access to a number of informational and control features. To display the Main Menu, from the Main Screen press **Ent**. .



***POWER + SA** Main Menu*

The Main Menu options are described briefly in Table 4-1 below. The options are described in more detail elsewhere in this book:

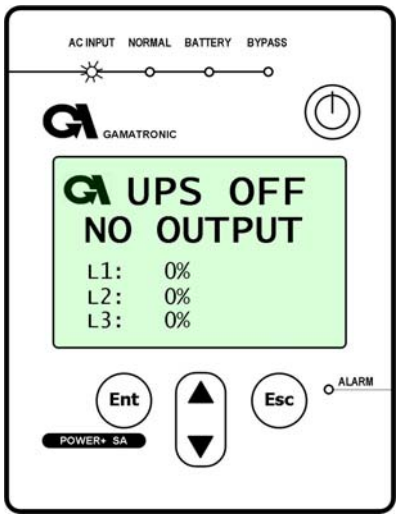
Table 4-1: Main Menu options

Event Log	:	The event log displays current alarm conditions and lists a history of significant events. See page 35.
Set Clock	:	Lets you set the date and time used by the UPS. See section 9.1.
Select Language	:	This feature not applicable for this model
Battery Test	:	Shows you when the next automatic battery test is scheduled to occur; lets you perform a manual battery test. See page 42.
Advanced Options	:	A sub-menu. See “Miscellaneous functions” on page 58 for an image of this sub-menu.

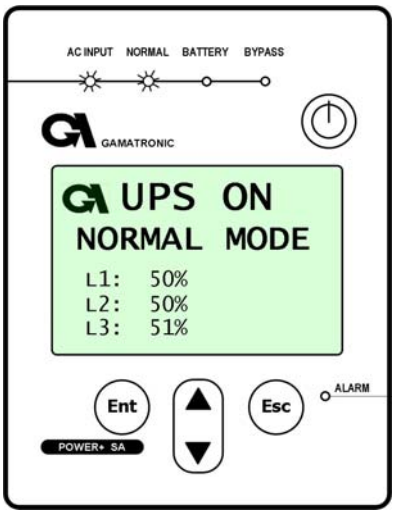
5. DAILY OPERATION

POWER + *SA* Start-up

This section explains how to start-up the *POWER* + *SA* after a shutdown. You are beginning the process from the UPS OFF NO OUTPUT screen.



1. Press the ON/OFF button twice.
   The BYPASS and ALARM LEDs light up for about 40 seconds.
2. After a short time the screen reads
   "UPS ON, NORMAL MODE".
   The AC INPUT and NORMAL LEDs are lit.



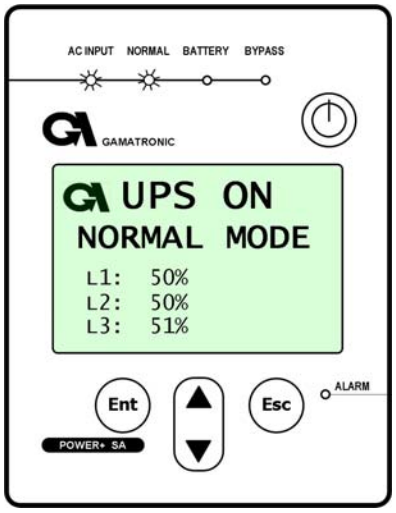
3. You can now turn on the computers or other equipment connected to the UPS.

***POWER* + *SA* start-up is now complete.**

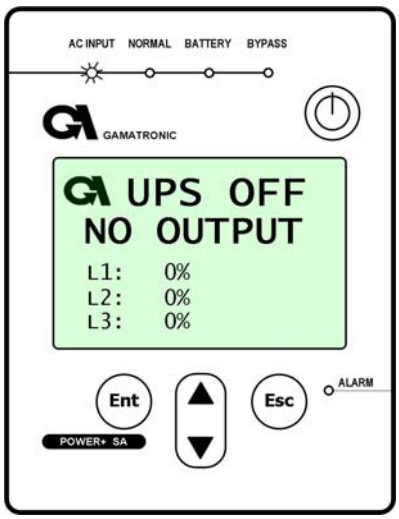
POWER + SA Shutdown

This section describes the shutdown procedures for the UPS if you want to shut it down for a period of time during which the load devices will not be operating.

Begin the process from the UPS ON, NORMAL MODE screen.



1. It is advisable to turn of all equipment connected to the ***POWER + SA***.
2. Press the ON/OFF button twice.
   The ALARM LED lights up for a few seconds,
   then the screen reads “UPS OFF, NO OUTPUT”.



***The POWER + SA* shutdown is now complete.**

6. THE EVENT LOG

The event log is really a combination of two functions:

- A display of active alarms
- A history of important events that occurred to the UPS.

Alarms

In the event of an alarm (the audible alarm sounds or the red alarm light on the ***POWER+ SA*** console lights up), go to the event log to determine the nature of the problem. (Pressing the **Esc** key from the Main Screen silences the audible alarm.)

Navigating to the event log

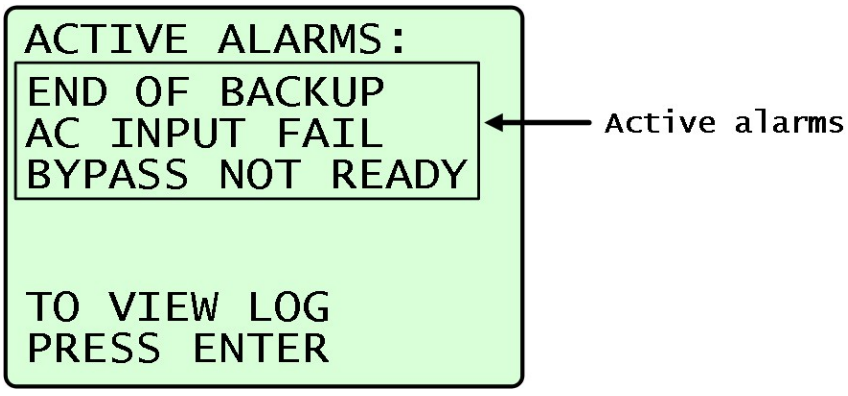
To see the event log:

From the Main Screen, press the **Ent** button to display the **Main Menu**.

On the Main Menu, press **Ent** again.

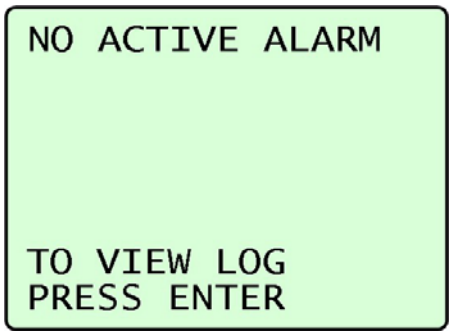
Active alarm display

The first thing you see upon entering the event log is the active alarm display. If there are any active alarms, a 1-line message is displayed for each alarm to indicate the nature of the alarm. For example, in the following illustration there are three active alarms: END OF BACKUP (i.e., the battery has been exhausted), AC INPUT FAIL, and BYPASS NOT READY.



A list of all possible alarms can be seen on page 38.

If there are no active alarms, the display indicates this.



Event log entries

To **see the latest entry** in the Event Log, from the Active Alarm display press **Ent**.

To **scroll backwards** to previous entries, press the **Down** button.

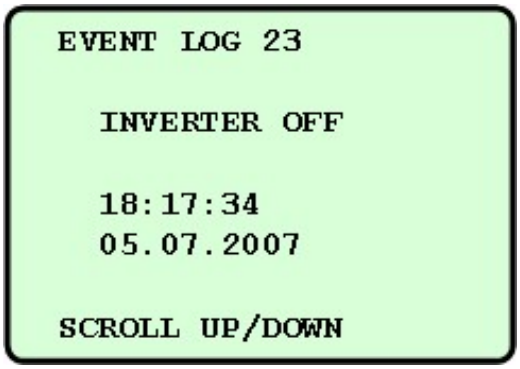
To **scroll forward** again to later entries, press the **Up** button.

To **exit the Event Log** entirely and return to the Main Screen, press **ESC**.

A list of all possible log entries can be seen on page 41.

The event log has the capacity to record 200 events. When this number is exceeded, the logwriter "wraps around" to the beginning of the file, so that the oldest events in the log are overwritten by the newest events.

The illustration shows a typical log entry.



- The first line gives the number of the log entry. This is the 23rd log entry.
- The second line gives the log text – in this case, "INVERTER OFF". The log entry shows that the inverter was turned off.
- The third line show the time of the log entry (HH:MM:SS).
- The fourth lines shows the date of the log entry (DD.MM.YY).
- The last line prompts you to scroll up or down to see later or earlier entries.

Resetting the event log

To erase the current contents of the event log:

1. From the Main Screen, press the **Ent** button to display the **Main Menu**.
2. On the Main Menu, select **Advanced Options > Technicians Menu > Reset Event Log**.
3. Press **Ent**.

OUTSTANDING ALARM MESSAGES

ALARM MESSAGE	Explanation
AC INPUT FAIL	**Meaning:** The voltage of one or more of the input ac phases is out of range, or there is no ac input at all. The UPS is now in Battery Mode. **Additional indications:** The alarm LED lights up and the audible alarm sounds. The symbol ☒ appears on the ac Input screen. **Action:** If there is a power outage, it is advisable to save any critical open files you are working on before the UPS battery is exhausted. See chapter 13, "In the event of an ac power outage". If there is not a power outage, check the circuit breaker for the line supplying the UPS with power. The circuit breaker may be off.
AC OUTPUT FAULT	**Meaning:** The voltage of at least one of the output ac phases is out of range. **Additional indications:** The alarm LED lights up and the audible alarm sounds. The symbol ☒ appears on the Ac Output screen. **Action:** After a power outage, this message can be ignored. This message could also be the result of an overload. Reduce the load on the UPS; this may resolve the problem. If not, contact Gamatronic Technical Support.
BATTERY LOW	**Meaning:** The battery will soon be fully discharged. **Additional indications:** The alarm LED lights up and the audible alarm sounds. The symbol appears on the Main Screen. **Action:** Shut down your computer or other equipment connected to the UPS.
BATTERY TEST FAIL	**Meaning:** The most recent battery test has failed. **Additional indications:** The alarm LED lights up and the audible alarm sounds. The symbol appears on the Main Screen. **Action:** It is possible that the most recent battery test occurred after a power outage and before the battery had fully recharged. Wait until two hours have elapsed from the most recent battery test and perform a manual battery test. See "Manual battery test" on page 42.

BYPASS NOT READY	**Meaning:** The voltage of at least one of the Bypass phases is out of range, and a transfer to Bypass mode cannot be made at this time. **Additional indications:** The alarm LED lights up and the audible alarm sounds. The symbol ☒ appears on the Bypass screen. **Action:** This alarm can be the result of a power outage, in which case it can be ignored. Otherwise, check the circuit breaker for the line supplying the Bypass voltage. The circuit breaker may be off.
END OF BACKUP	**Meaning:** The batteries have been exhausted, and the UPS has turned itself off. **Additional indications:** The UPS has turned itself OFF. The symbol. ▯ appears on the Main Screen. **Action:** Wait for ac power to return. Then, if the UPS is in Auto Restart mode it will start up automatically; otherwise, start the UPS manually by pressing the OFF/ON button twice.
INV. SYNC. FAULT	**Meaning:** The Inverter is not synchronized with the Bypass voltages. **Additional indications:** The alarm LED lights up and the audible alarm sounds. The symbol ☒ appears on the Inverter screen. **Action:** Check the voltage readings on the Inverter screen. If the readings are in range and the alarm persists, contact Customer Support.
INV. VOLT. FAULT	**Meaning:** The voltage of one or more of the Inverter output phases is out of range. **Additional indications:**The alarm LED lights up and the audible alarm sounds. The symbol ☒ appears on the Inverter screen. **Action:** Contact Customer Support.
LOAD ON BYPASS	**Meaning:** The output voltage is the Bypass voltage. **Additional indications:** **Action:** If the UPS was set to Bypass mode manually ("Manual Bypass" appears on the Main Screen), you can manually return it to inverter mode to end the alarm condition. If the UPS moved to Bypass mode automatically, an overload condition may have been the cause ("OVERLOAD" appears on the Main Screen). In this case, try reducing the load on the UPS.

ONE PHASE FAULT	**Meaning:**One or more of the ac phases into the Charger is out of range. **Additional indications** The alarm LED lights up and the audible alarm sounds. **Action:** This is likely to be due to a problem with the input ac supply.
OVERLOAD	**Meaning:**There is an overload condition. **Additional indications** The alarm LED lights up and the audible alarm sounds. If the output current is between 104 – 117%, for 10 minutes, or between 117 – 131% for one minute, or above 131% for 20 msec, the UPS shuts down. The symbol appears on the Main Screen. **Action:** Reduce the load to the UPS quickly, or the UPS will automatically move to Bypass mode.

LOG MESSAGES

Log Entry	Explanation
AC LINE FAULT	No input voltage to charger.
AC LINE OK	Input voltage to charger has been restored
BATT. TEST FAIL	The last battery test failed.
BATT. TEST.OK	The last battery test was successful (following a failed battery test).
END OF BACKUP	Battery has been completely discharged.
RECHARGING	Mains power has returned and battery is recharging.
INVERTER OFF	The inverter has been turned off.
INVERTER ON	The inverter has been turned on.
OVERLOAD	An overload condition exists.
LOAD IN RANGE	The load has returned to normal range.
LOAD ON BYPASS	The load is bypassing the inverter.
LOAD ON INVERTER	The load has returned to the inverter.
UPS OFF	The UPS was turned off.
UPS ON	The UPS was turned on.

7. BATTERY TESTS

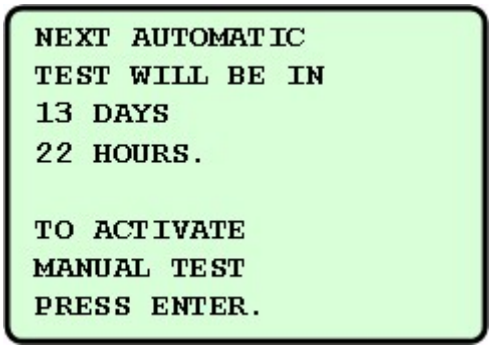
Automatic battery test

The ***POWER + SA*** is programmed to perform a battery test automatically every two weeks.

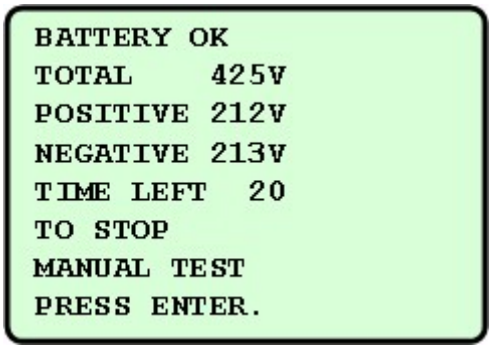
Manual battery test

To perform a battery test outside of the above-stated schedule (a "manual" battery test):

1. From the Main Screen, press the **Ent** button to display the **Main Menu**.
2. On the Main Menu select **Battery Test** and press **Ent**.
3. The resulting screen tells you the time until the next scheduled automatic battery test. To perform a manual test, press **Ent** again.



The battery test lasts for 60 seconds. The screen shows a countdown of the time remaining in the test. To end the test immediately, press **Ent** again.



If the ***POWER + SA*** batteries fail a battery test, the battery failure icon appears on the ***POWER + SA*** screen and remains there until a later battery test is passed.

8. FIRST-TIME SETUP

8.1 Cable Connections

Only an authorized electrician may wire the UPS power connections. Do not attempt to wire any of the power connections on your own.

USE REQUIRED WIRING SIZE ACCORDING TO THE NATIONAL ELECTRIC CODE, NSI/NFPA 70 (IN THE U.S.), OR THE CANADIAN ELECTRICAL CODE, SECTION 54 (IN CANADA).

EMPLOYEZ REQUIS EN CABLANT LA TAILLE SELON LE CODE ÉLECTRIQUE NATIONAL, NSI/NFPA 70 (DANS ÉTAS-UNIS) OU LE CODE ELECTRIQUE CANADIEN, SECTION 54 (DANS CANADA).

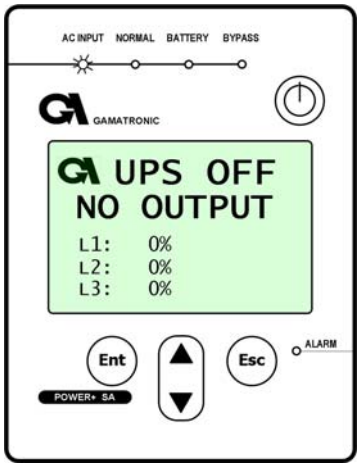
To connect the required cables to the UPS:

1. Verify that only cables rated in accordance with the values shown in Table 15-1 on page 64 are used.
2. Verify that all power lines coming into the ***POWER + SA*** have circuit breakers rated according to the values shown in Table 15-3 on page 64.
3. Using a Phillips screwdriver, remove the cable cover from the rear of the ***POWER + SA***.
4. Connect the input and output electrical cables as described in section 15.3.2 "Installing the *POWER + SA*" beginning on page 66.
   Be sure the wires are not live before you begin.
   Ensure that the proper phase order is followed.
5. After connecting the cables, recheck your work to verify that the cables and their wires are connected to the proper terminals.

8.2 Installation and Start-Up Sequence

To start the UPS:

1. Attach the load device, if desired, but do not turn it on until you have set the UPS output voltage, as described below.
2. Turn on the circuit breakers for the **ac input**, the **Bypass input**, and the **Battery**. The UPS performs a self test; this takes about a minute. Afterwards, you should see the following screen.



Set the output voltage

Before turning the UPS on, you must set the UPS output voltage, if needed.
See “Modifying the output ac voltage” on page 48.

Set the system clock

Now set the system clock to the correct date and time.
See “Setting the system clock” on page 46.

Modify the screen contrast (optional)

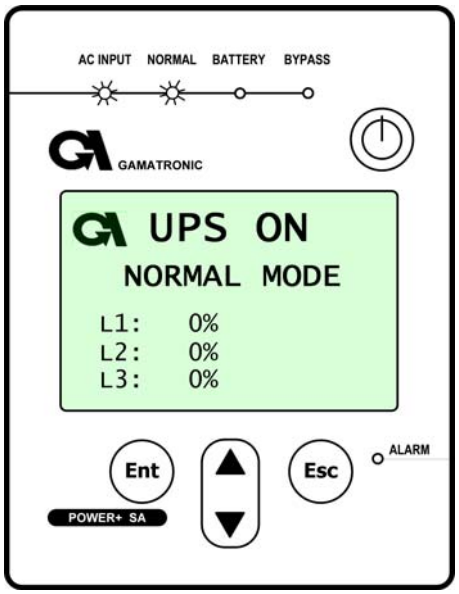
You can modify the screen contrast, if necessary.
See “Setting screen contrast” on page 47.

Set Automatic Restart mode (optional)

You can enable automatic restart mode at this time, if desired.
See “Automatic Restart” on page 54.

Operation

To turn the UPS on, press the ON/OFF button twice and wait a few seconds.
The following screen is displayed.



The “Ac Input” and “Normal” LEDs should be lit.

Turn on the **Ac Output** circuit breaker.

You can now operate the equipment attached to the ***POWER + SA***.

9. SETTING SYSTEM PARAMETERS

There are several system parameters that can be modified as needed. In general, you only need set these parameters once, during the first-time setup of the ***POWER + SA***.

9.1 Setting the system clock

The system clock is used in recording entries to the ***POWER + SA*** event log. The clock should be set to the correct time so that the log entries will reflect the true time of events.

To set the system clock:

1. From the Main Screen, press the **Ent** button to display the **Main Menu**.
2. On the Main Menu, select **SET CLOCK** and press **Ent**.
3. This displays the **CLOCK** screen, which shows the current time and date according to the ***POWER + SA*** clock. The information is displayed in the format
   HH:MM:SS
   DD:MM:YYYY
4. To change the time and date, press **Ent**.
   At any time in the following process you can press **Esc** to exit to the Main Screen. The changes you made before pressing **Esc** are saved.
5. The **SET MINUTES** screen is displayed.
   Use the **UP/DOWN** button to change the minutes setting.
6. Press **Ent**. The **SET HOUR** screen is displayed.
   Use the **UP/DOWN** button to change the hours setting.
7. Press **Ent**. The **SET DAY** screen is displayed.
   Use the **UP/DOWN** button to change the day setting.
8. Press **Ent**. The **SET MONTH** screen is displayed.
   Use the **UP/DOWN** button to change the month setting.
9. Press **Ent**. The **SET YEAR** screen is displayed.
   Use the **UP/DOWN** button to change the year setting.
10. Press **Esc** to exit to the Main Screen.

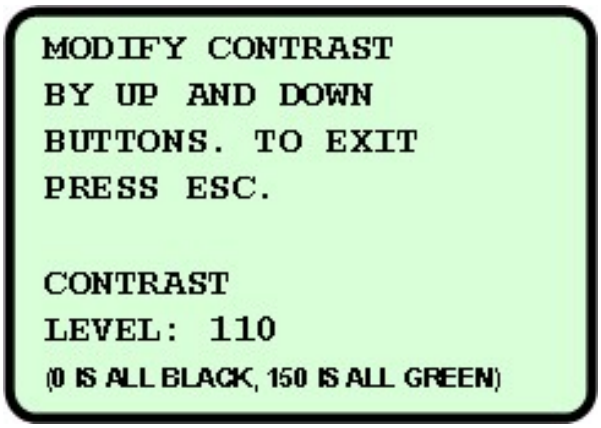
9.2 Setting screen contrast

The screen contrast function controls the visibity of the message text against the screen background. The default setting of 144 is usually satisfactory, but you can modify the default setting between the values of 0 and about 210, if needed.

To modify the console contrast:

1. From the Main Screen, press the **Ent** button to display the **Main Menu**.
2. From the Main Menu, select **ADVANCED OPTIONS** and press **Ent**.
3. From the ADVANCED menu select **SCREEN CONTRAST** and press **Ent**..

   The following screen is displayed.



4. Press the UP button repeatedly to make the screen “greener”. Press the DOWN button repeatedly to make the screen darker (blacker).

9.3 Modifying the output ac voltage

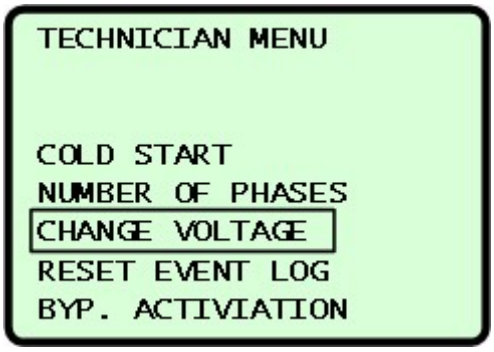
Do not change the output voltage unless you are sure that this is required by your load devices and that the new output voltage will not damage the load devices.

Two types of adjustments can be made to the output voltage:

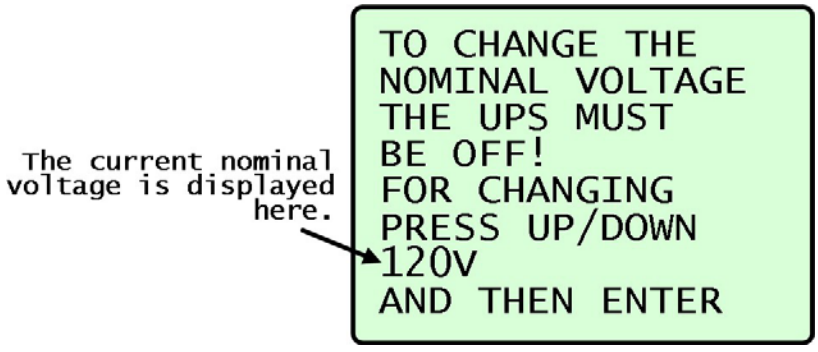
- The nominal ac output voltage can be changed.
- The voltage of each ac output phase can be fine-tuned.

9.3.1 To change the nominal output ac voltage:

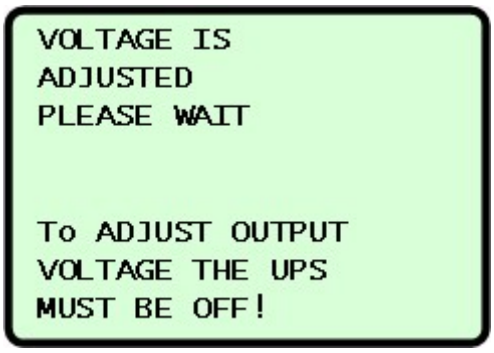
1. If the ***POWER + SA*** is not already in "off" mode, press the **ON/OFF** button twice to turn the UPS **off**.
2. From the Main Screen, press the **Ent** button to display the **Main Menu**.
3. On the Main Menu, choose **ADVANCED OPTIONS** and press **Ent**.
4. In the ADVANCED MENU, select **TECHNICIAN MENU**.
5. In the TECHNICIAN MENU select **CHANGE VOLTAGE**.



6. You are prompted to choose the type of voltage to change.
   Select **OUTPUT VOLTAGE**.
7. You are prompted to choose a change to the nominal value or an adjustment (fine-tuning). Choose **NOMINAL VALUE**.
8. Use the **UP/DOWN** button to change the output voltage. You can adjust it in a range from 110 to 120 V. Press **Ent** to apply the change.



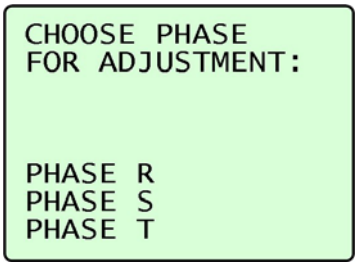
After pressing **Ent** the screen looks like this:



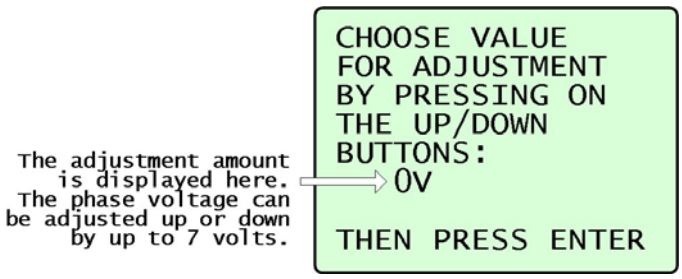
9. The UPS fans may stop working for a moment. They will start up again by themselves after the voltage adjustment is complete.
10. Press **Esc** to return to the Main screen.

9.3.2 To adjust (fine tune) the ac output voltage

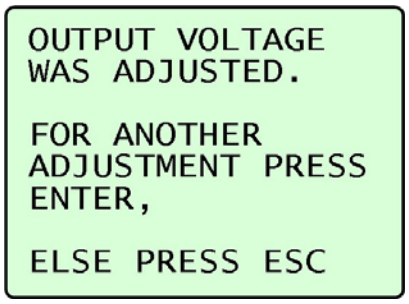
1. From the Main Screen, press the **Ent** button to display the **Main Menu**.
2. On the Main Menu, choose **ADVANCED OPTIONS** and press **Ent**.
3. In the ADVANCED MENU, select **TECHNICIAN MENU**.
4. In the TECHNICIAN MENU select **CHANGE VOLTAGE**.
5. You are prompted to choose the type of voltage to change.
   Select **OUTPUT VOLTAGE**.
6. You are prompted to choose a change to the nominal value or an adjustment (fine-tuning). Choose **DO ADJUSTMENT**
7. You are prompted to choose the phase to be adjusted. Choose a phase.



8. Use the UP and DOWN buttons to specify the voltage adjustment value. The voltage can be adjusted up or down by up to 7 volts.


The adjustment amount is displayed here. The phase voltage can be adjusted up or down by up to 7 volts.
CHOOSE VALUE
FOR ADJUSTMENT
BY PRESSING ON
THE UP/DOWN
BUTTONS:
0V
THEN PRESS ENTER

9. You can continue to adjust another phase, or press Esc to return to the main screen.

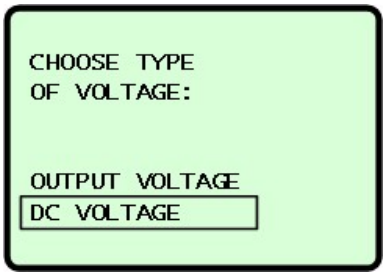


9.4 Setting the dc voltage

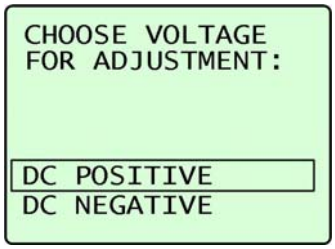
The ***POWER + SA*** must be informed of the dc (battery) voltage. Before setting the dc voltage, measure and record the positive and negative voltage of the battery with a multimeter, observing all appropriate safety precautions.

Then, to set the dc voltage:

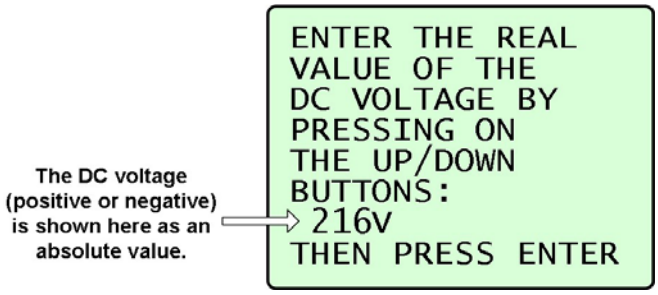
1. From the Main Screen, press the **Ent** button to display the **Main Menu**.
2. On the Main Menu, choose **ADVANCED OPTIONS** and press **Ent**.
3. In the ADVANCED MENU, select **TECHNICIAN MENU**.
4. In the TECHNICIAN MENU select **CHANGE VOLTAGE**.
5. You are prompted to choose the type of voltage to change.
   Select **DC VOLTAGE**.



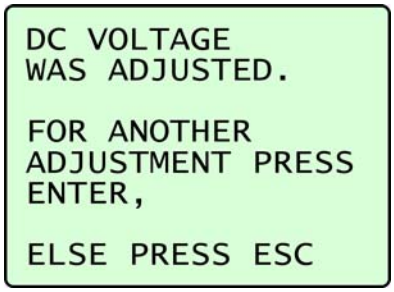
6. You are prompted to choose whether you want to set the positive dc voltage or the negative dc voltage. Select your choice and press **Ent**.



7. Use the **UP** and **DOWN** button to specify the actual value for the positive (or negative) voltage. Press **Ent** to apply the change.


The DC voltage (positive or negative) is shown here as an absolute value.
ENTER THE REAL VALUE OF THE DC VOLTAGE BY PRESSING ON THE UP/DOWN BUTTONS:
216V
THEN PRESS ENTER

8. Following the same procedure as for the positive voltage, set the negative voltage.



9. When finished, press **Esc** to return to the Main Screen.

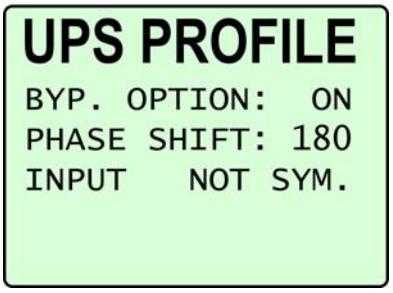
10. BYPASS OPTION ACTIVATION / DEACTIVATION

The ***POWER + SA*** should not be operated without the bypass option except under the supervision of a qualified technician.

Operation of the ***POWER + SA*** without a bypass source can result in damage to the equipment (load devices) connected to the UPS. No one but a qualified technician should be permitted to deactivate the bypass mode capability.

Before activating or deactivating the bypass option, verify the current status of the bypass option by going to the UPS profile screen #3:

From the Main Screen, press ▼ three times.

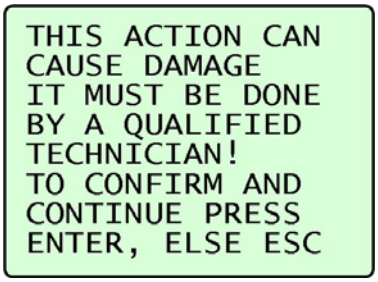


The current status of the bypass option is shown in the first line under the "UPS PROFILE" header.

To deactivate the bypass option:

1. If the ***POWER + SA*** is not already in "off" mode, press the **ON/OFF** button twice to turn the UPS **off**.
2. From the Main Screen, press the **Ent** button to display the **Main Menu**.
3. On the Main Menu, choose **ADVANCED OPTIONS** and press **Ent**.
4. In the ADVANCED MENU, select **TECHNICIAN MENU**.
5. In the TECHNICIAN MENU select **BYP. acTIVATION**.

6. A warning message is displayed.



Read the message and press **Ent** to continue, or **Esc** to exit.

7. A message displays the current state of the bypass option: OFF or ON. Press **Ent** to change the bypass status or **Esc** to exit.

11. AUTOMATIC RESTART

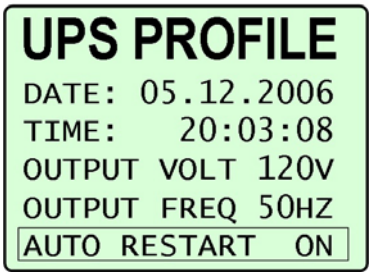
In the event of a prolonged power outage, the UPS turns itself off automatically after the batteries have been exhausted. You can instruct the ***POWER + SA*** to start up automatically when the ac power is restored. This feature is called *automatic restart*.

If you do not use the automatic restart procedure, when the ac power returns the recharging process begins automatically, but no power is supplied to the load.

Determining the current automatic restart setting

To determine if the automatic restart mode is on or off, go to the PROFILE screen

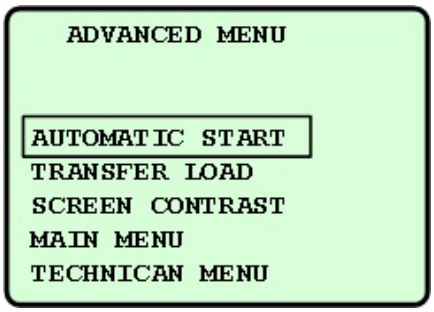
To see the UPS Profile screen, from the **Main Screen**, press the **Down** button once.



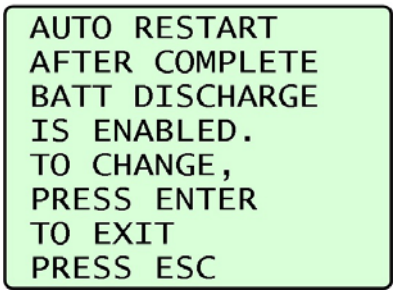
The Profile screen shows the current Automatic Restart status.

Changing the automatic restart status

1. From the Main Screen, press the **Ent** button to display the **Main Menu**.
2. On the MAIN MENU, select **ADVANCED MENU** and press **Ent**.
3. On the ADVANCED MENU, select AUTOMATIC RESTART and press ENT.

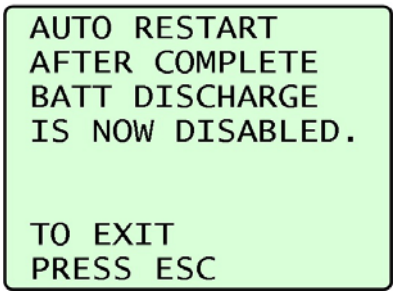


4. Press **Ent** to change the automatic restart status.



The new automatic restart status is displayed.

5. Press **Esc** to return to the Main Screen.



12. MISCELLANEOUS FUNCTIONS

This section describes infrequently used but important features.

Manually entering or leaving bypass mode

When the ac input power is normal, it is handled by the UPS in one of two ways:

- The input ac power is sent to the inverter, where it is regulated and passed on to the load. This is called normal mode or inverter mode.
- The input ac power bypasses the inverter entirely and goes directly to the load with no regulation. This is called **Bypass Mode**.

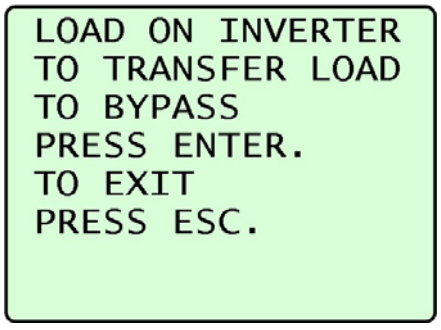
Usually only a technician will need to manually switch the UPS to Bypass mode.

To manually enter or leave bypass mode:

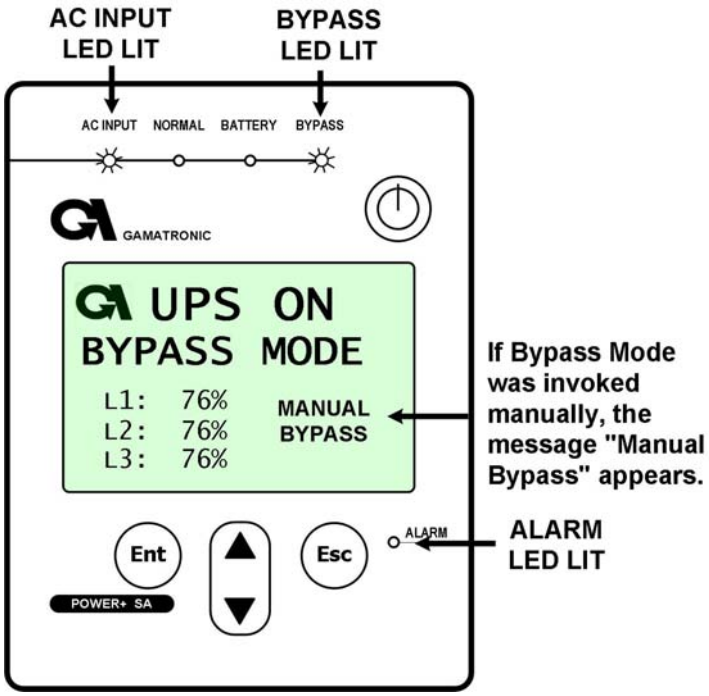
1. From the Main Screen, press the **Ent** button to display the **Main Menu**.
2. On the MAIN MENU, select **ADVANCED MENU** and press **Ent**.
3. On the ADVANCED MENU, select **TRANSFER LOAD** and press **Ent**.

The TRANSFER LOAD screen tells you if the load is currently on the INVERTER or if the UPS is in BYPASS MODE.

4. Press **Ent** to switch the load.



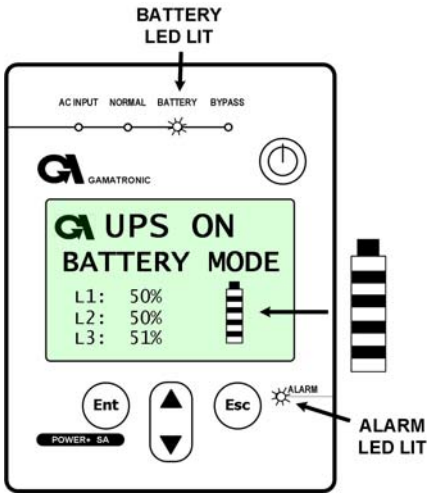
On the Main Screen, the message "**Manual Bypass**" appears in the lower right quadrant. The audible alarm sounds after 60 seconds.



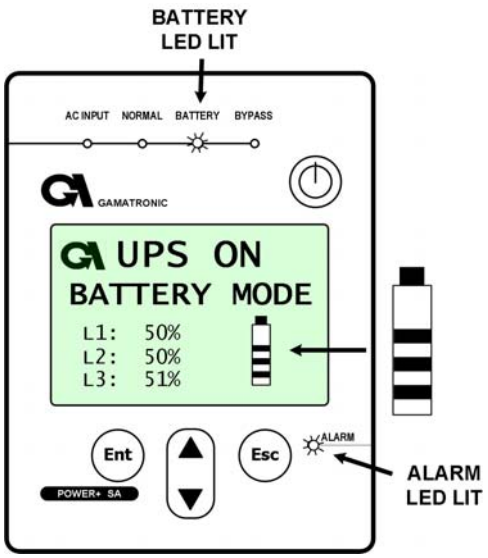
13. IN THE EVENT OF AN AC POWER OUTAGE

If a power outage occurs:

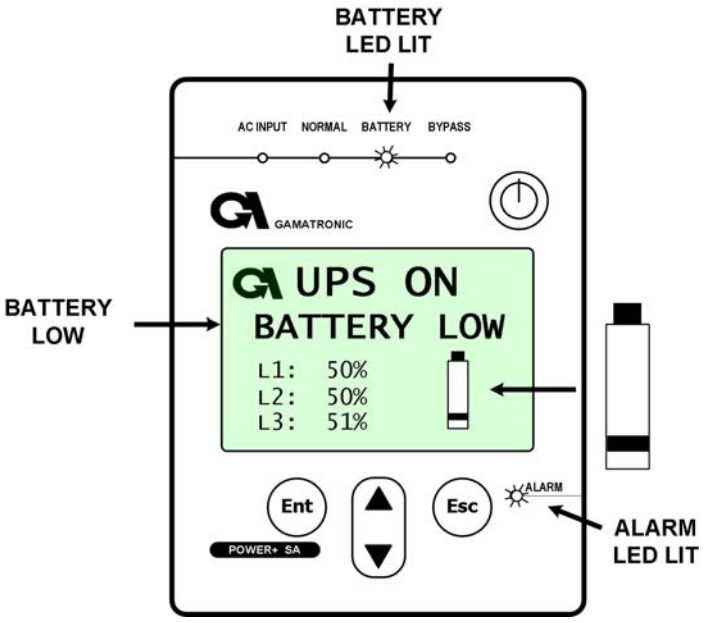
The Alarm LED lights up and the audible alarm sounds. The UPS continues operating, drawing its power from the batteries. The ***POWER + SA*** console looks like this:



The Alarm and Battery LEDs are lit. As the battery discharges, the number of "stripes" in the battery icon on the screen decreases.

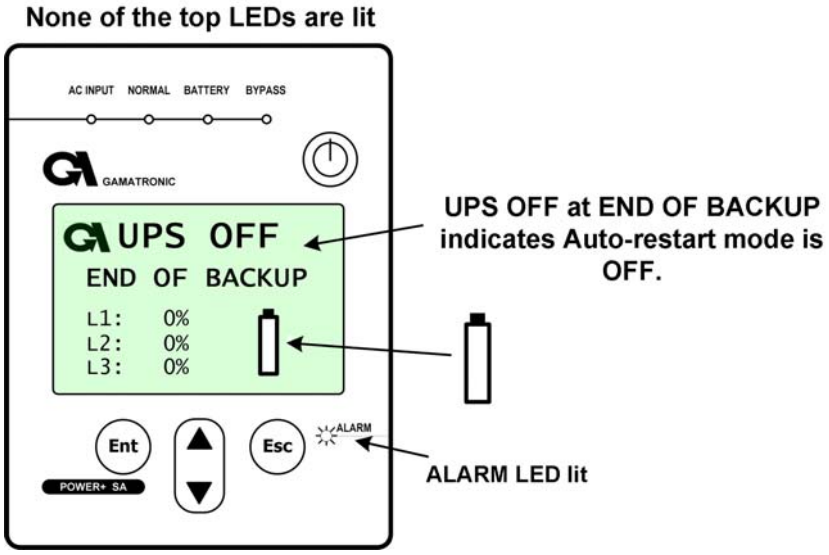


When the "BATTERY LOW" message appears, there are only a few seconds before the battery is exhausted. Now is the time to shut down any computers connected to the UPS if you have not already done so.

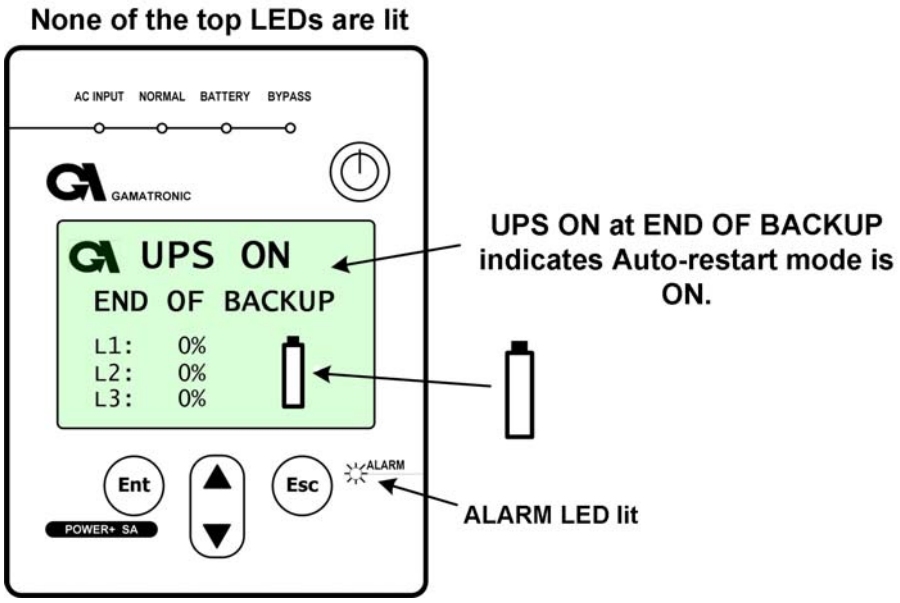


When the UPS battery is exhausted, the UPS does one of two things, depending on the setting of Auto-restart mode:

- If Auto-restart is DISABLED, the UPS shuts off and remains off, even when ac power is restored. When ac power is restored you must press the OFF/ON button twice to turn on the UPS.



- If Auto-restart is ENABLED, the Main Screen shows the UPS ON message. When ac power is restored, the UPS starts up automatically.



14. TROUBLESHOOTING

This section explains what to do in the event of an alarm condition, or when any other "out of the ordinary" event occurs on the UPS.

Alarm sounds and/or alarm LED lights up

1. Go to the Event Log and look at the Active Alarm Display to determine the nature of the alarm. See "Navigating to the Event Log" and "Active Alarm Display" on page 35.
2. Look for the appropriate heading below according to the nature of the alarm, and follow the instructions.

Electricity returned but UPS remains in battery mode

Check the external circuit breaker for the ac line. The circuit breaker may be off.

Battery test failed

It may be that an automatically scheduled battery test was executed shortly after the end of a power outage, when the battery was still charging. Wait until about two hours after the return of the ac power and perform a manual battery test. This should clear the alarm.

The UPS remains in bypass mode

The UPS may have been put in bypass mode manually. In such a case, the lower left quadrant of the Main Screen says "manual bypass". To manually return the UPS to normal mode, see "Manually entering or leaving bypass mode" on page 56

Sync Fault

Verify that the ac Input and the Bypass Input lines are connected to the UPS in proper phase sequence.
Verify that ac of the proper frequency (Hz) is being used. (See Table 20-1 on page 81.)

15. INSTALLATION AND SETUP

Read and understand the following procedure before planning your installation.

15.1 External Inspection

1. Inspect equipment and shipping containers for any signs of shipping damage or mishandling. Do not attempt to install the system if damage is apparent. If any damage is noted, file a damage claim with the shipping agency within 24 hours and contact your Gamatronic authorized service representative to inform them of the damage claim and the condition of the equipment.
2. Check for loose connections or unsecured components in the UPS module.
3. Check for any unsafe feature that may present a potential safety hazard.

15.2 Site Preparations

CAUTION!

- Electrical codes may vary according to location. Observe all local, state, and federal electrical codes for acceptable external wiring practices**.**
- If the UPS is not installed according to the instructions in this manual, it may interfere with radio communications equipment. The UPS has been tested and found to comply with the limits for a Class A computing device pursuant to Part 15 of the FCC rules, which are designed to provide reasonable protection when operated in a commercial environment.
- Operation of this equipment in a residential area may cause radio frequency interference, in which case the user will be required at his own expense to take whatever measures may be necessary to shield the UPS.

15.2.1 Installation Considerations

1. Use the shortest possible output distribution cable runs at the installation site, consistent with logical equipment arrangements and in compliance with NEC and local electrical codes. Allow space for additional future equipment.
2. The recommended ambient temperature for operation is 20-30°C (68-86°F). Humidity must be less than 95% non-condensing. In altitudes above 2000 meters (6560 feet), the UPS rating will be reduced.
3. The route and foundation to the installation site must be capable of supporting the weight of cabinets and moving equipment. Plan the route to ensure that the unit will pass through all elevators, corners, and doorways to prevent damage. Refer to *POWER+ SA* Specifications on page 87 for specific information regarding the cabinet size and weight.
4. Place electrical equipment (load, computer monitor, etc.) at least one meter away from the UPS.

15.2.2 Equipment Location

1. As with all electrical equipment, installation and serviceability will be easier if access is provided on all sides of the equipment.
2. Verify adequate clearance around cabinet to allow unrestricted exhaust air to flow (12 inches minimum).
3. Verify that the UPS system is installed in a clean, cool, and dry location.

15.2.3 Site Connection Diagram

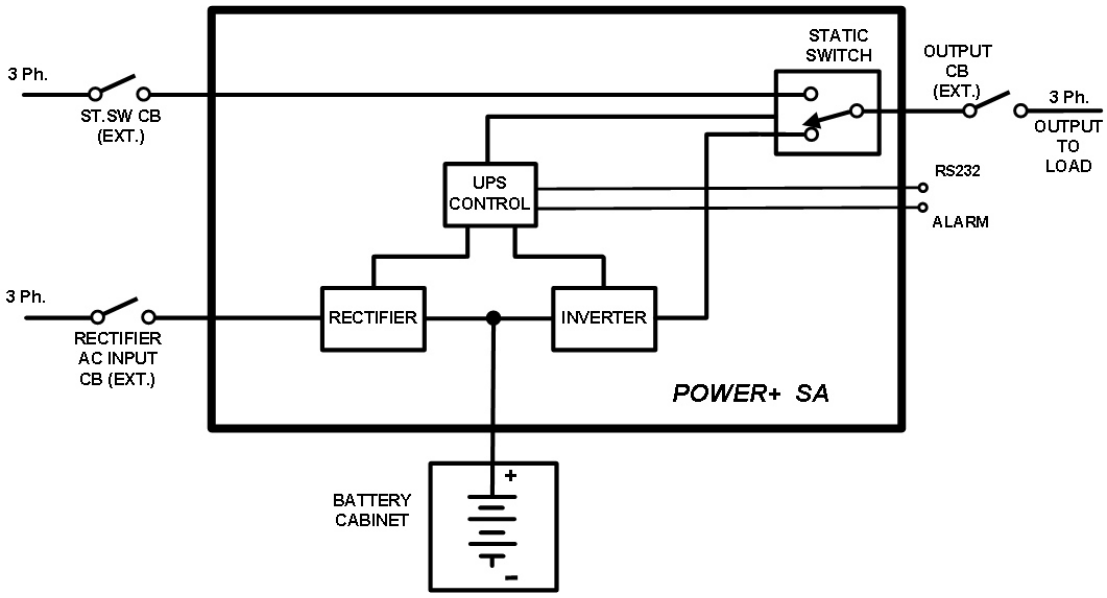


Figure 15-1: Site connection block diagram

15.2.4 Electrical Wiring

1. Verify that power wiring is run in an individual separate conduit or cable tray. Verify that control wiring is run in an individual separate conduit.
2. For proper conductor size refer to Table 15-1, which has been prepared in accordance with NEC requirements. (Please check your local electrical codes to ensure compliance with the given grades.) The values shown in Table 15-2 conform to UL requirements.

Table 15-1: Electrical ratings and external wiring requirements

RATINGS & EXTERNAL WIRING REQUIREMENTS FOR THE *POWER+ SA*, 3:3 PHASE, 10 kVA, 60 Hz GE MODEL					
Basic unit ratings at full load		**kVA/kW**	**VOLTAGE (Volts)**	**CURRENT (Amps)**	**CONDUCTOR SIZE**
ac INPUT	**ac Input to UPS** Full Load Current 3Ø, (1) Neutral, (1) Gnd	-	208	28	(5) x 8 AWG
ac OUTPUT	**UPS ac Output** Full Load Current 3Ø, (1) Neutral, (1) Gnd	10/8	208	28	(5) x 8 AWG

Table 15-2: Required wire ratings

AC OUTPUT GND, N, L1, L2, L3	BYPASS INPUT GND, N, L1, L2, L3	AC INPUT GND, N, L1, L2, L3	BATTERY INPUT GND, +, N, -
8 AWG	8 AWG	8 AWG	8 AWG

3. Ensure that the lines coming into the UPS are equipped with circuit breakers of the capacity shown in Table 15-3 below.

Table 15-3: UL-required circuit breaker ratings

LINE	**CIRCUIT BREAKER RATING**
UPS output	35 A
Bypass	35 A
ac input	35 A

15.3 Installation Process

15.3.1 Safety guidelines

CAUTION!

- Only an authorized electrician may perform installation. Do not attempt to perform any of the following instructions on your own.
- Electrical codes may vary according to location. Observe all local, state, and federal electrical codes for acceptable external wiring practices**.**
- If the UPS is not installed according to the instructions in this manual, it may interfere with radio communications equipment. The UPS has been tested and found to comply with the limits for a Class A computing device pursuant to Part 15 of the FCC rules, which are designed to provide reasonable protection when operated in a commercial environment.
- Operation of this equipment in a residential area may cause radio frequency interference, in which case the user will be required at his own expense to take whatever measures may be necessary to shield the UPS.

15.3.2 Installing the *POWER + SA*

For 2-phase use, follow the instructions in section 20.1.1 beginning on page 84, rather than those in this section.

Before continuing, read carefully the preceding part of this chapter beginning from section 15.2* "Site Preparations" ***on page 62 if you have not already done so. Pay special attention to the safety warnings and wiring requirements.***

To install the UPS and prepare it for initial start-up:

1. Verify that the external circuit breakers in the mains electrical cabinet for **UPS input**, **UPS output**, and **bypass** are **OFF**. No voltage should be present in the cables.
2. Verify that the **battery cabinet** circuit breaker is **OFF**.
3. Remove the protective cover from the UPS rear panel.
4. Connect the UPS wiring according to the labeling on the unit, shown in Figure 15-3 on page 67.

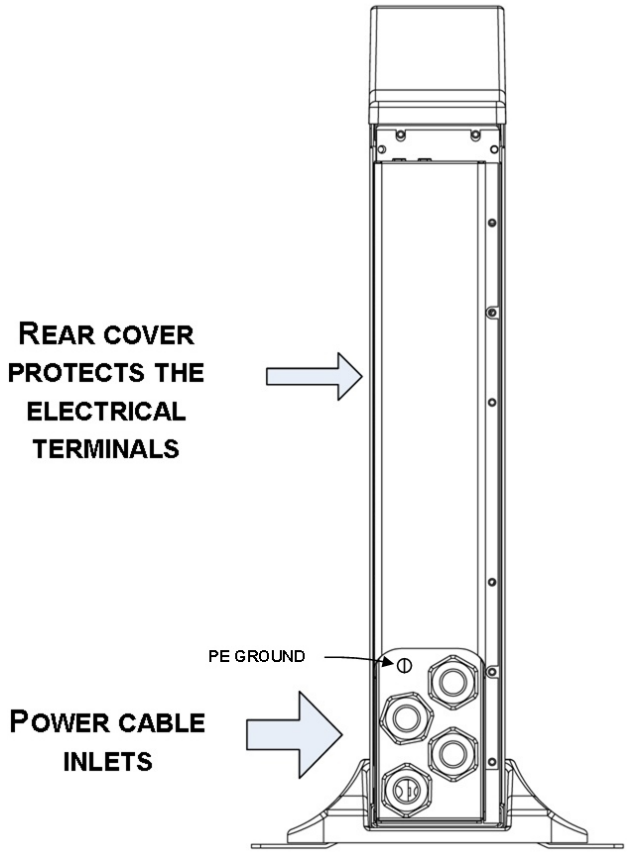


Figure 15-2: UPS rear panel with protective cover

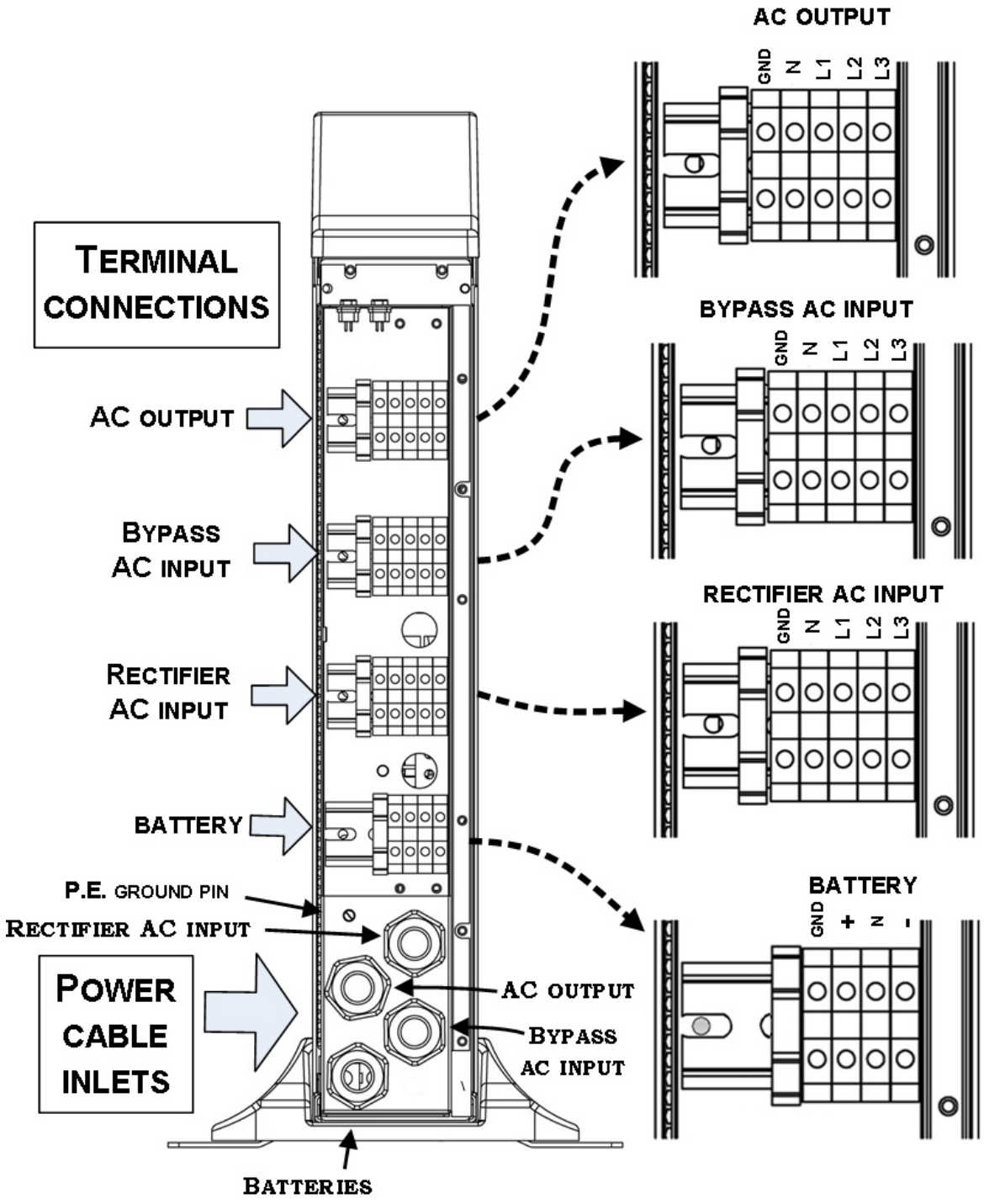


Figure 15-3: UPS rear panel view, with protective cover removed

5. Run the **ac output cable** through the cable holder labeled “ac output” in Figure 15-3 on page 67. Connect the cable to the ac output terminals, also detailed in Figure 15-3. Use the appropriate grade of wire as specified in Table 15-1 on page 64, or according to local electrical codes.

6. Run the two **ac input cables** through the cable holders labeled “ac input” and “Bypass ac input” in Figure 15-3 on page 67. Connect the cables to their respective input terminals (“Rectifier ac input” and “Bypass ac input”), also shown in Figure 15-3. Use the appropriate grade of wire as specified in Table 15-1 on page 64, or according to local electrical codes.
7. Run the **batteries cable** through the cable holder labeled “Batteries” in Figure 15-3. Use the appropriate grade of wire as specified in Table 15-1 on page 64, or according to local electrical codes.
8. Tighten all cable holders so that the cables are fastened securely.

Continue to section 15.3.3, “Battery installation”.

15.3.3 Battery installation

Figure 15-4: Batterybox - front right view

Figure 15-5: Battery box - front view

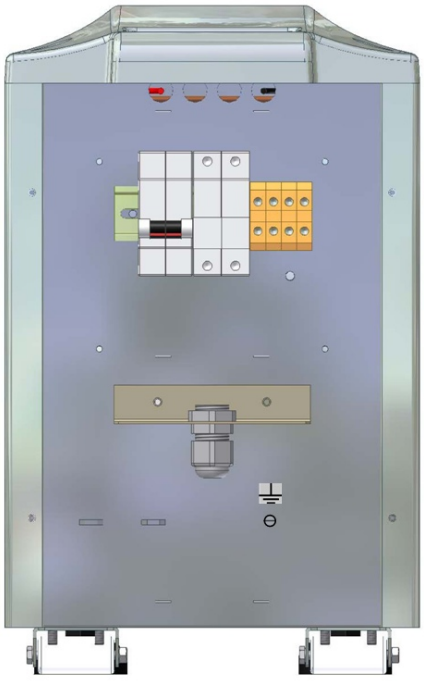


Figure 15-6: Battery box, front view, front cover removed

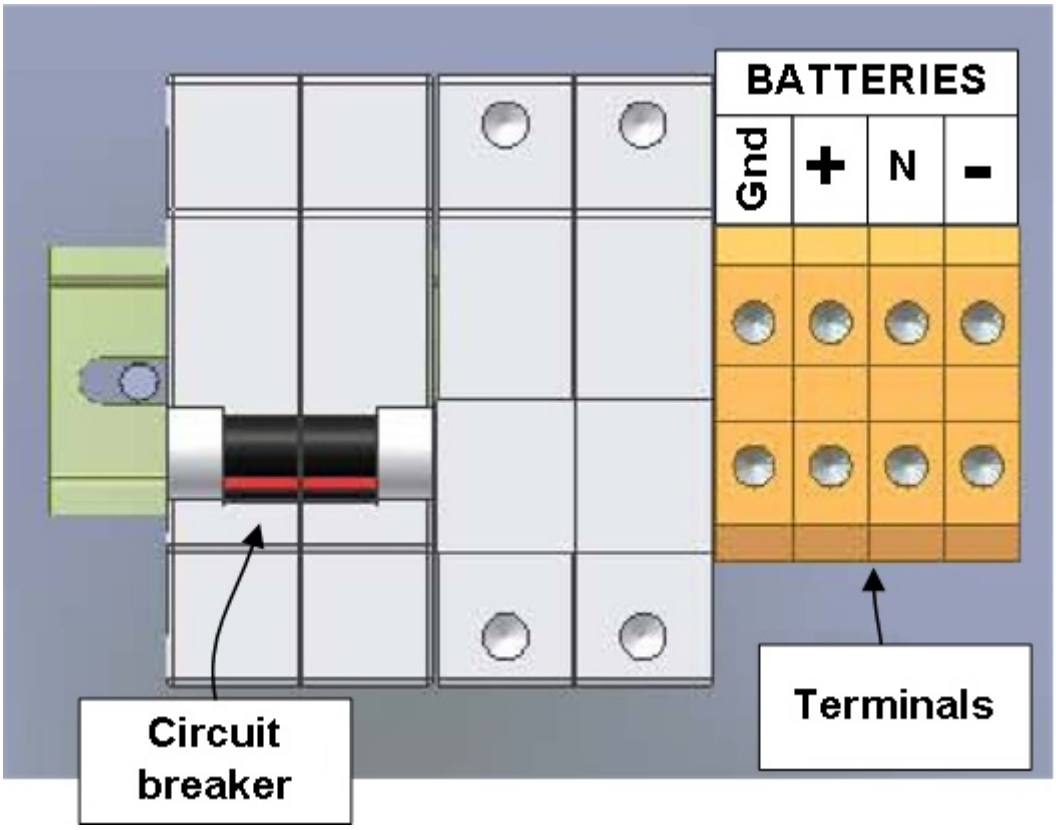


Figure 15-7: Battery box circuit breaker and terminals

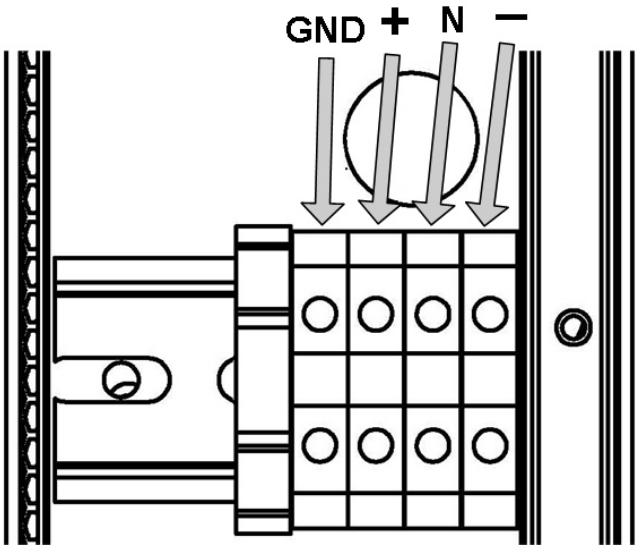


*Figure 15-8: Battery terminals on the **POWER + SA** rear panel*

To install the battery and prepare it for initial UPS start-up:

1. Verify that the battery circuit breaker is OFF and that the UPS is OFF, and that there is no power on the UPS cables.
2. Position the battery box as described in section15.2.2, “Equipment Location”, on page 63.
3. Remove the front panel from the battery box. See *Figure 15-6*.
4. On the ***POWER+ SA***, run the battery cable through the cable holder labeled “Batteries”, shown in Figure 15-3 on page 67. Attach the cable to the UPS’s “Battery” terminals as labeled in Figure 15-8 above. The other end of the battery cable must be attached to the battery box terminals as labeled in Figure 15-7 above.
5. Tighten the cable holder holding the battery cable on the UPS.
6. Replace the cover of the battery box terminals.

Continue to the next section.

15.4 Verifications Prior to First-Time Operation

After connection of the ***POWER + SA*** and its batteries as described in sections 15.3.2 and 15.3.3 and before first-time use, the following verifications must be performed.

1. Verify that the ac input cables from the external power source to the UPS Input are connected and fastened securely. (Follow and verify the phase sequence.)
2. Verify that the ac output cables from UPS to the load are connected and fastened securely. (Follow and verify the phase sequence.)
3. Verify that the cable between the UPS’s battery terminals and the batteries is correctly and securely connected on both ends.
4. Verify that any additional control wiring is run in individual, separate conduits.
5. Verify that all power connections are tight.
6. Verify that all control wire terminations are tight.
7. Verify that all power wires and connections have proper spacing between exposed surfaces, phase-to-phase, and phase-to-ground.
8. Replace the protective cover over the terminal connectors on the ***POWER+ SA*** and on the battery box.

15.5 First-Time Startup and Verification Test:

1. Turn **ON** the UPS input circuit breaker.
2. Verify that the **UPS output** circuit breaker and the **battery** circuit breaker on the battery cabinet both remain **OFF**.
3. Press twice on the UPS ON/OFF button on the ***POWER + SA*** front panel.

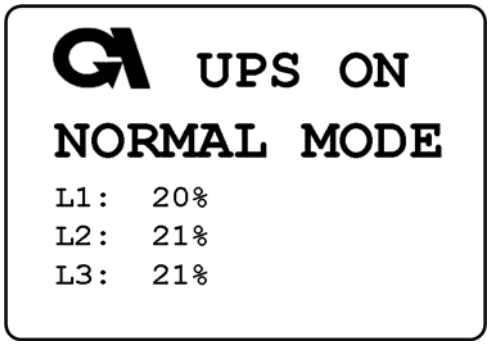
ON/OFF button

4. Turn **ON** the Battery circuit breaker on the battery cabinet.
5. Verify that
   - The messages “UPS ON” and “NORMAL MODE” appear on the LCD screen.
   - The LEDs “ac INPUT” and “NORMAL” are lit.
   - All other LEDs are off.
6. Perform a manual battery test as described in Section “Manual Battery Test” on page 42 to verify the condition of the battery and that it is properly connected to the UPS.
7. Turn **ON** the **UPS Output** circuit breaker.

Risk of electrical shock!

Input/Output voltage is present on the terminals.

8. The UPS is ready to take the load. Ask the equipment operator to turn on the devices connected to the UPS.
9. Look at the Main Screen and verify that the UPS is loaded by the customer’s equipment. The LCD on the UPS front panel should display the percentage of power being consumed by the load from each input phase.



10. After verifying that the load is drawing power from the UPS, press twice on the battery test button.

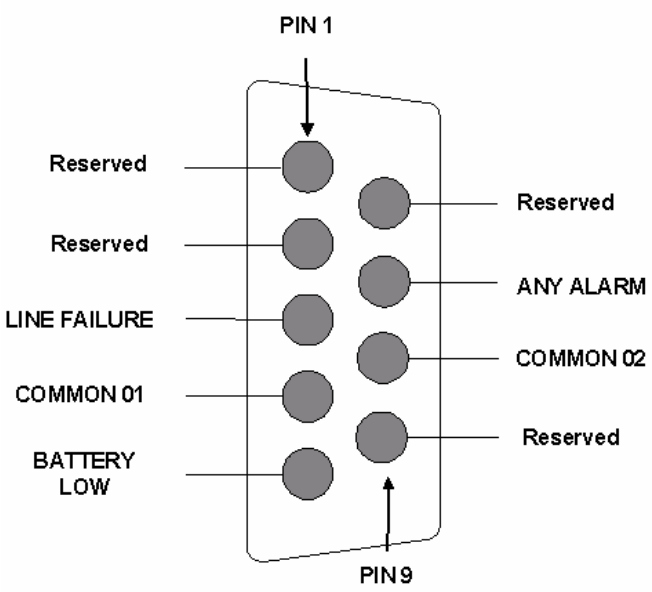
    Verify that the the “battery test failed icon does not appear on the LCD screen, and that the Alarm LED is OFF.

11. The UPS restart is now complete.

16. ALARM DRY CONTACTS

The rear panel of the UPS contains a standard RS232 port labeled ALARM. This port is an interface to the Alarm Dry Contacts. The Alarm Dry Contact port is shown below.

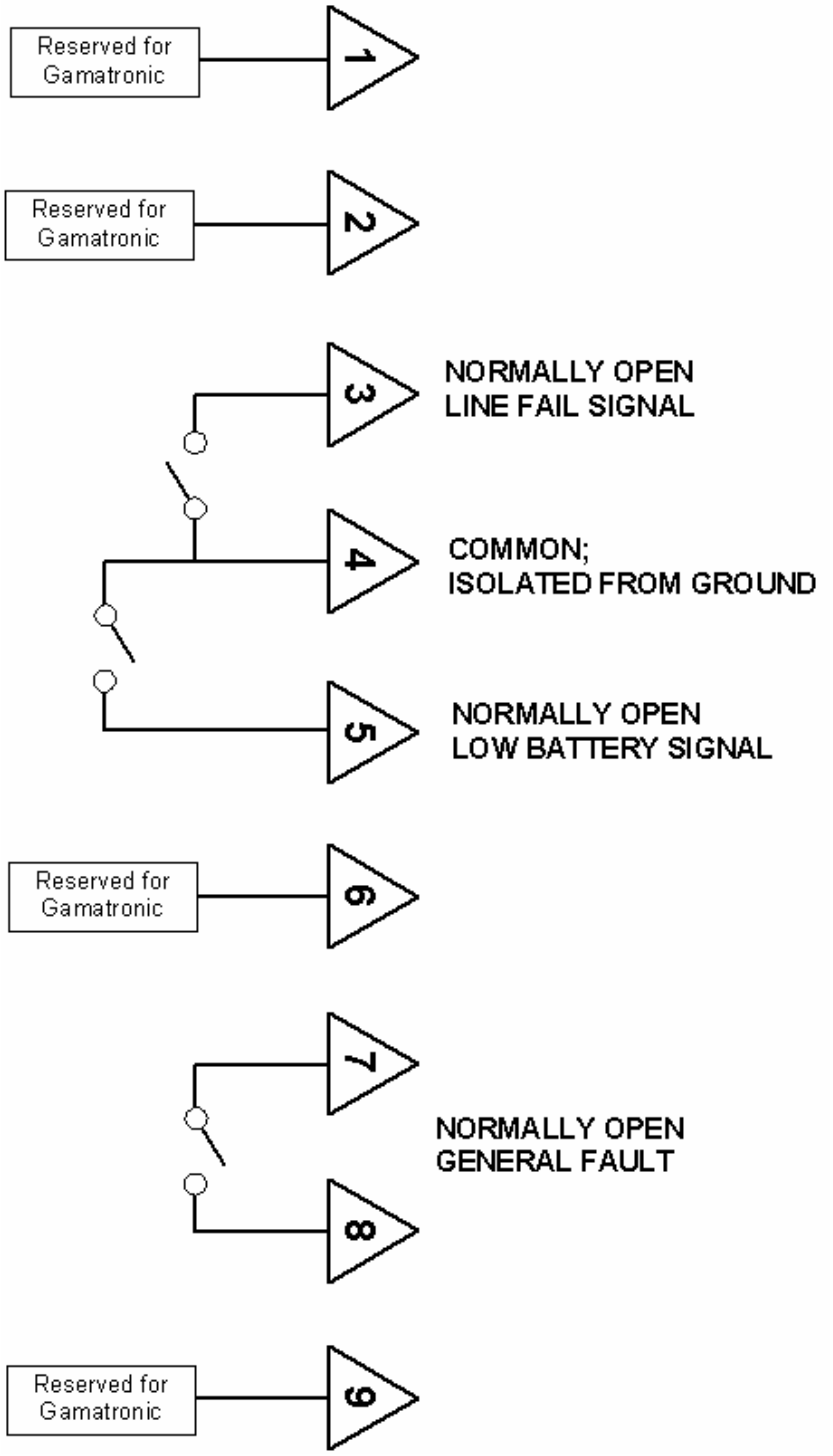
The Alarm Dry Contacts can be used to notify a computer or another system when certain events take place on the ***POWER + SA*** UPS system.



The Alarm Dry Contacts can report any of three conditions, as described in the following table.

Alarm Condition	State of Dry Contacts
No input voltage to the rectifier	There is a voltage between pin 3 and pin 4. This circuit is normally open.
Battery voltage is low	There is a voltage between pin 5 and pin 4. This circuit is normally open.
Any alarm condition exists	There is a voltage between pin 7 and pin 8. This circuit is normally open.

The following figure is a schematic of the Dry Alarm Contacts.



17. RS232 INTERFACE

The ***POWER + SA*** may be connected to a computer or a modem using a shielded cable, with an RS232-type 9-pin female connector. The cable should not exceed15 meters. The RS232 plug is located on the rear panel of the ***POWER+ SA***.

The connection allows the user to read data from the UPS, and to control it as well.

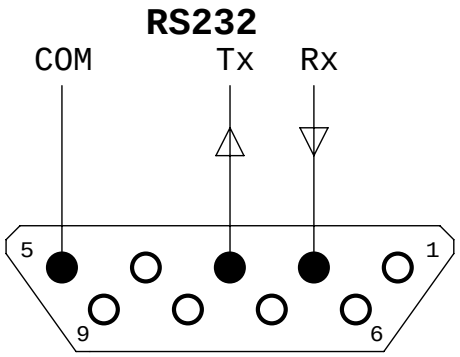
There are two types of UPS connections:

- Directly to a host computer with dedicated software.
- Remote control through a SNMP/WEB management programs for communication with a computer network (optional).

In order to use the RS232 connection to a computer, monitoring software must be installed on the user's PC. The monitoring software can be ordered from Gamatronic.

The PIN assignment for this 9-pin connector is shown in the diagram below.

The communication is half-duplex, 9600 baud-rate, no-parity, 1-stop bit, Rx, Tx and COM lines, no-flow control (neither h/w nor s/w).



RS232 Connector

18. SNMP AGENT (OPTIONAL)

The SNMP agent enables monitoring, management, control, and orderly shutdown of the UPS via the Internet protocol SNMP.

There are two types of SNMP agents:

- External Adaptor
- Internal Card

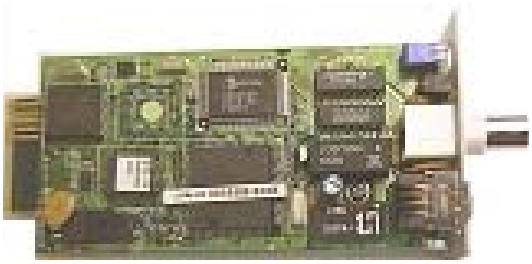
The SNMP agent communicates with the RS232 interface of the UPS which:

- Supports standard UPS RFC1628 MIB
- Supports the SNMP commands Trap, Set, and Get
- Transfers UPS indicators such as voltage, frequency and current via the Internet browser or any management system (NMS).

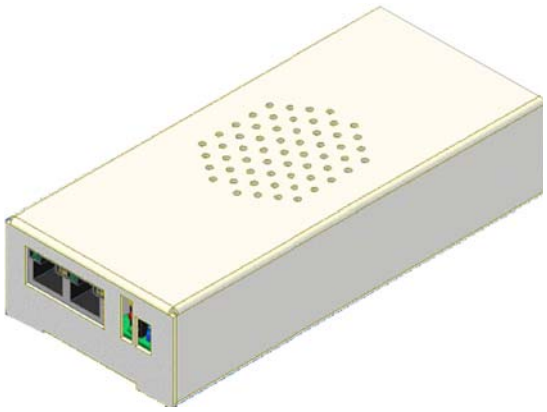
Use of an SNMP agent disables the RS232 interface of the UPS.

Options:

INTERNAL CARDS



EXTERNAL ADAPTOR



***POWER+ SA** lets you monitor and control your **POWER+ SA** UPS*

19. WIRELESS CONTROL (OPTIONAL)

The ***POWER+ SA*** system includes an option for wireless control and management, using the Gamatronic WING (Catalog reference 199WING).

The **WING** (Wireless New Generation) is a wireless communications board that enables you to manage and control your UPS and other power systems from a remote location via cellular network (GSM/GPRS/CDMA).

It allows real-time detection of power system faults and immediately notifies selected recipients (control center, technician, etc.) detailing the faults.

WING can operate through a variety of parallel connections, protocols and applications at the same time. It is compatible with all Gamatronic products, as well as with the products of many other manufacturers.

The **WING** comprises:

- *WING* board
- A SIM board
- Application management software dedicated to wireless communications.

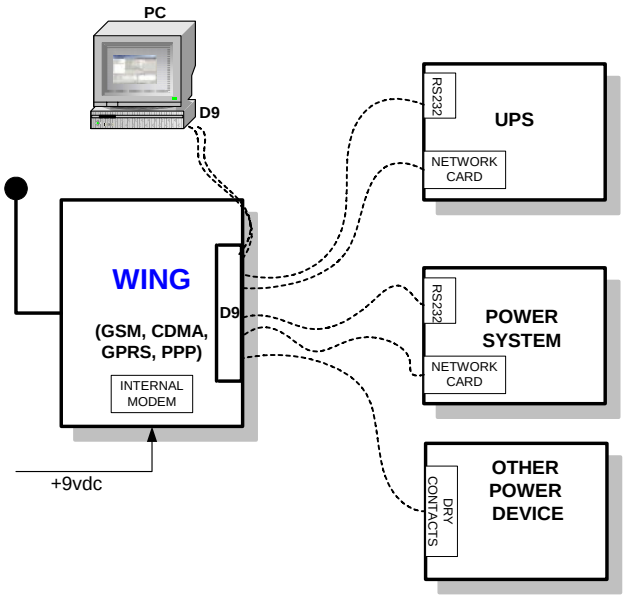


Figure 19-1: WING General Block Diagram

The **WING** board contains an internal GSM/GPRS Modem plus antenna and a microprocessor that enables it to manage the power systems, monitor and control their

values and status, and get real-time alarm notifications – all via any standard mobile cellular phone.

The user may communicate with the **WING** by either using a mobile cellular phone or the dedicated GeMSi application provided by Gamatronic.

A service technician can perform the following activities using his mobile phone:

- Specify the code or command appropriate to the specific needs
- Send a message via SMS to the system ID

The system replies, informing the sender whether the command was performed. The board can filter the received messages by authorizations (complete management/monitoring only/none).

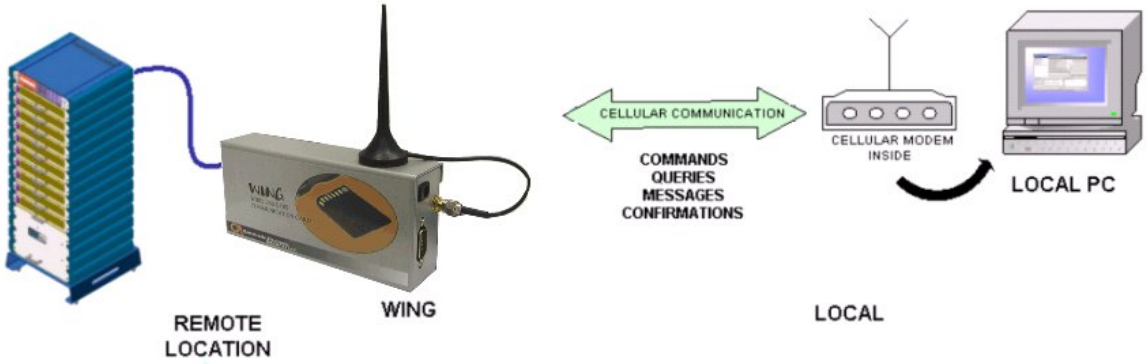
The **WING** scans the remote power system every three seconds and alerts all the predefined recipients. (up to 10 recipients) whenever a malfunction occurs.

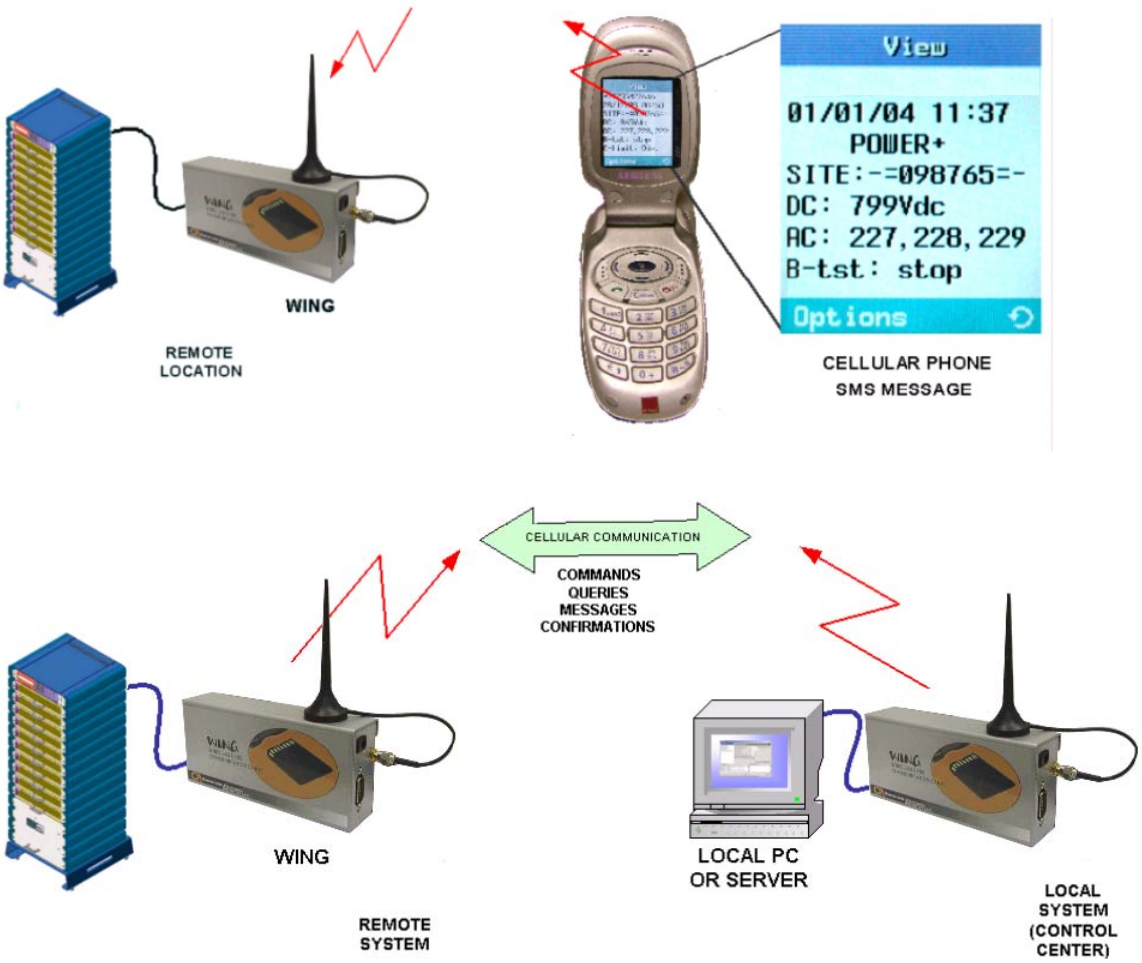
The **WING** enables you to protect your system by 2 levels of passwords (administrator, technician) and broadcast a message in the case of an alarm.

WING Configurations

The **WING** may be used in three types of configurations:

- PC & WING at the local end, and WING and power system at the remote location.
- PC & cellular modem at the local end, and WING and power system at the remote location.
- Cellular at the local end, and WING and power system at the remote location.





WING Optional Configurations

20. CONFIGURING THE *POWER+ SA* FOR 2- AND 3-PHASE USAGE

Your ***POWER+ SA*** UPS can be configured to operate with 2- or 3-phase input and output. The electrical details for the various possibilities are shown in Table 20-1. A cable connection diagram for 2- and 3-phase operation is shown in Figure 20-1. Detailed instructions for 2-phase wiring are in section 20.1.

Table 20-1: 2- and 3-phase configuration – electrical details

	PHASES (IN/OUT)	INPUT VOLTAGE	OUTPUT VOLTAGE	INPUT CURRENTS	OUTPUT POWER	INPUT WIRING	OUTPUT WIRING	OUTPUT CURRENT
OPTION 1	3/3	3x120V+N (3x208V)	3x120V+N (3x208V)	3x23.6	10kVA/8kW	L1, L2, L3, N, G	L1, L2, L3, N, G	3x28A
OPTION 2	2/2	2x120V+N (1x208V)	2x120V+N (1x208V)	2x26.5	7.5kVA/6kW	L1, L2, N, G	**[L1+L3], L2, N, G	***2x31A
OPTION 3	2/2	2x120V+N (1x240V)	2x120V+N (1x240V)	2x26.5	7.5kVA/6kW	L1, L2, N, G	**[L1+L3], L2, N, G	2x31A

** For output, link terminals L1 and L3 to create phase 1, L2 is phase 2. Both output phases ([L1+L3] and L2) provide the same current.

*** This value applies when a neutral connection is used.

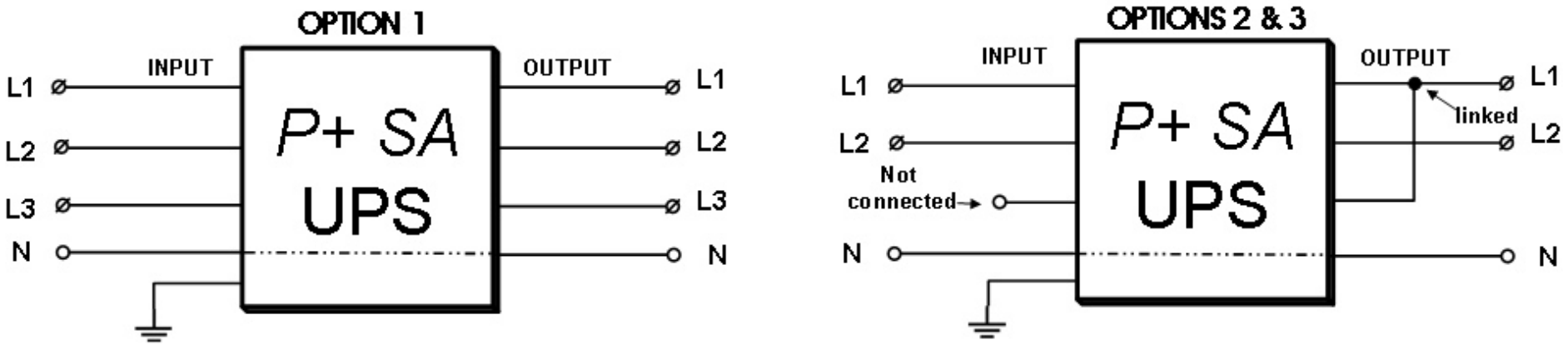


Figure 20-1: Wiring diagram

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20.1 Input and output wiring for two-phase operation

As shown in Table 20-1, there are two options for two-phase operation:

- Where the two input phases to the UPS have a phase shift of 120°. In this case, the effective input and output voltage between the phases is 208 Vac.
- Where the two input phases to the UPS have a phase shift of 180°. In this case, the effective input and output voltage between the phases is 240 Vac.

Input and output wiring for two-phase operation

For both two-phase options, the wiring is the same (refer to Figure 20-2):

For input: One input phase is connected to UPS input L1, the second phase is connected to UPS input L2. UPS input L3 is not used. Neutral input is connected to the neutral connector of the ac input terminal, and ground is connected to the ground connector of the ac input terminal.

For output: UPS output L3 is linked to UPS output L1. The load takes one output phase from L1, the second output phase from L2. Neutral output comes from the neutral connector of the ac output terminal. Ground for the load comes from the ground connector of the ac output terminal.

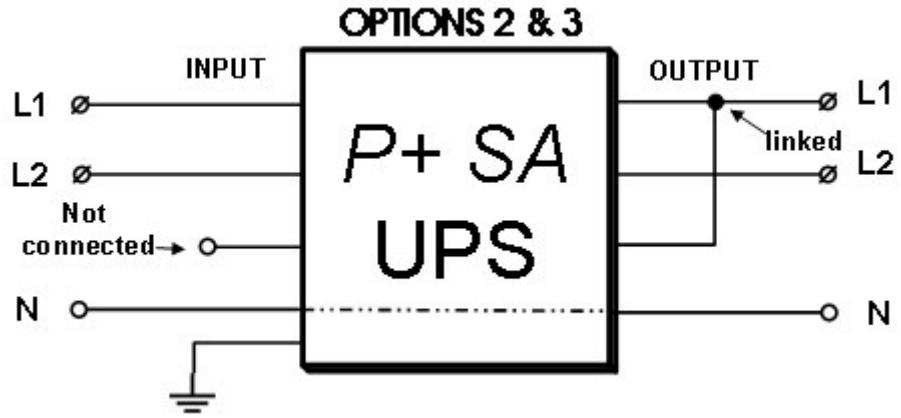

Figure 20-2: Wiring overview for symmetrical 2-phase operation

20.1.1 Installing the *POWER+ SA* for 2-phase usage

Follow the following steps to Install the UPS and prepare it for initial start-up:

To install the UPS and prepare it for initial start-up:

1. Verify that the external circuit breakers in the mains electrical cabinet for **UPS input**, **UPS output**, and **bypass** are **OFF**. No voltage should be present in the cables.
2. Verify that the **battery cabinet** circuit breaker is **OFF**.
3. Remove the protective cover from the UPS rear panel.
4. Connect the UPS wiring according to the labeling on the unit, shown in Figure 20-4 on page 85.

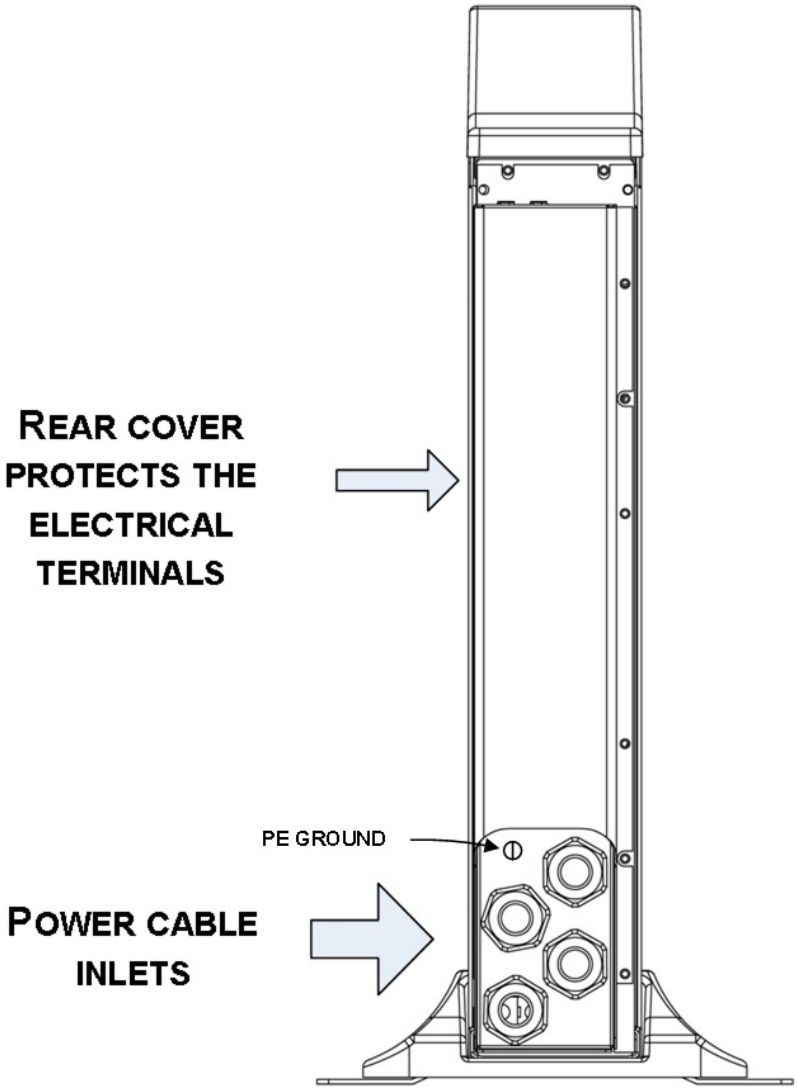

Figure 20-3: UPS rear panel with protective cover

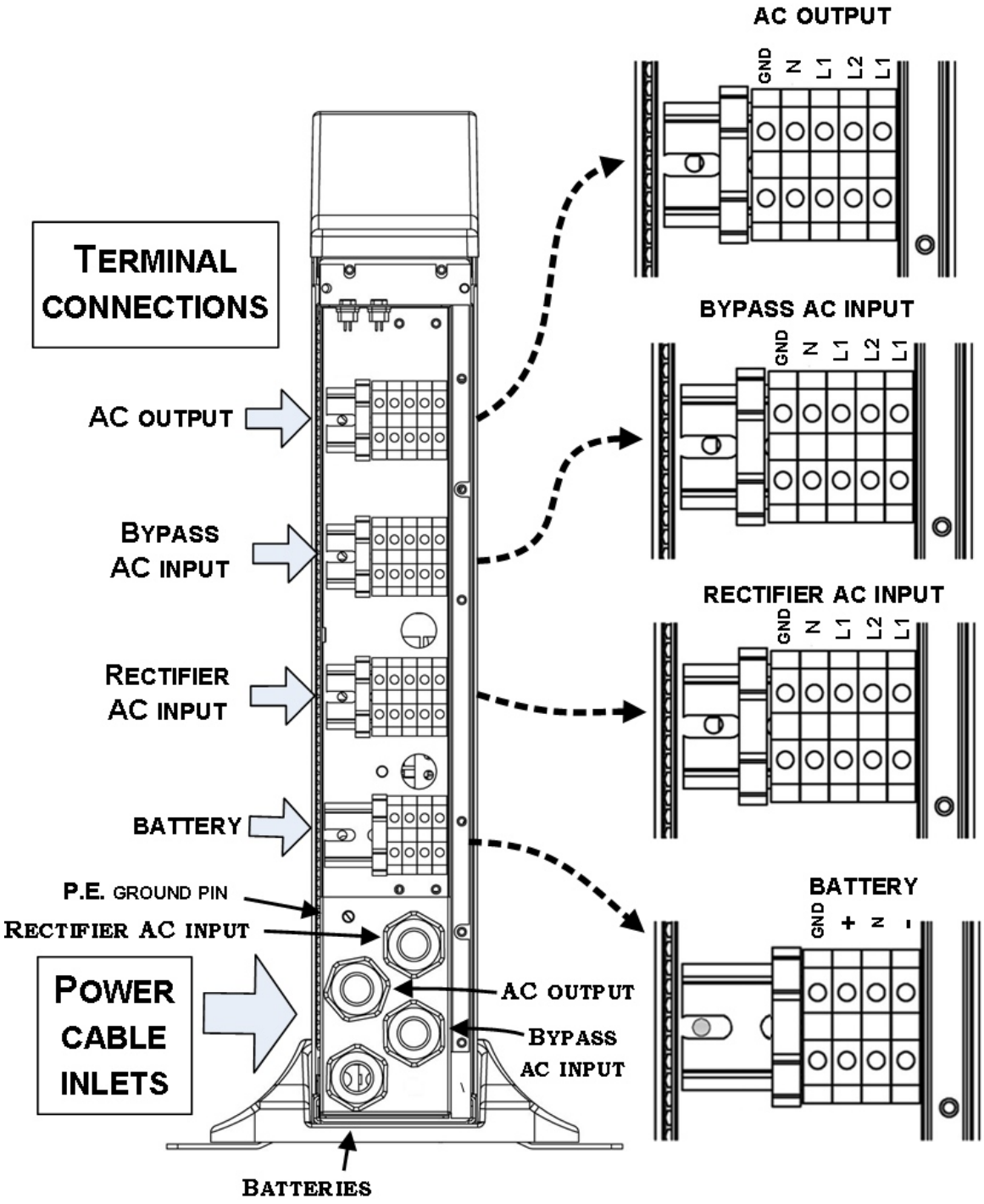

Figure 20-4: UPS rear panel view, with protective cover removed

5. Run the **ac output cable** through the cable holder labeled “ac output” in Figure 20-4 on page 85. Connect the cable to the ac output terminals, also detailed in Figure 20-4. Use the appropriate grade of wire as specified in Table 15-1 on page 64, or according to local electrical codes.
6. Run the two **ac input cables** through the cable holders labeled “ac input” and “Bypass ac input” in Figure 20-4 on page 67. Connect the cables to their

respective input terminals (“Rectifier ac input” and “Bypass ac input”), also shown in Figure 20-4. Use the appropriate grade of wire as specified in Table 15-1 on page 64, or according to local electrical codes.

7. Run the **batteries cable** through the cable holder labeled “Batteries” in Figure 20-4. Use the appropriate grade of wire as specified in Figure 20-4 on page 64, or according to local electrical codes.
8. Tighten all cable holders so that the cables are fastened securely.

Continue to section 15.3.3, “Battery installation”.

21. *POWER+ SA* SPECIFICATIONS

***POWER+ SA* UPS**	**3X208 V+N**	**2X120 V+N**
Topology	True on-line battery, double conversion	
Model	10 kVA	
Input		
Voltage (V)	3x208 V+N	2x120 V+N
Voltage range (%)	– 27% and + 20%	
Current	28A max. per phase, no inrush current at startup	
Frequency	47— 63 Hz	
Power walk-in (sec)	> 60	
Power factor	0.99	
THDI (%)	5	
Output		
Rated power	10 kVA / 8 kW	7.5 kVA / 6 kW
Frequency tracking range	60 Hz ±1, ±2, ±3 (selectable)	
Slew rate	1 Hz/sec	
Voltage (V)	3x208 V+N	2x120 V+N
Static regulation %	±1	
Regulation for unbalanced load %	±1 for 100% unbalanced load	
Dynamic response to 100% load step (%)	2	
Overload	110% : 10 minutes; 125% : 60 seconds; 1000% : 1 cycle	
Waveform	Sinusoidal	
THD (%)	Less than 2 for linear load	
Load CF	6:1	
Dc/Ac efficiency (nominal)	96%	
Ac/Ac efficiency (nominal)	94%	
Static Switch		
Input connection	Dual input	
General		
Maximum power dissipation (Po=8KW)	510W (1740 BTU)	384W (1310 BTU)
Ambient temperature (°C)	-10 to +40 (operating) -20 to +60 (storage)	
Relative humidity (%)	95 max., non-condensing	
Altitude (m)	1500 without derating	
Enclosure	IP20	
Cooling system	Multi-fan with speed control (forced)	
Acoustic noise (full load) at 1.5m	51dBA	
MTBF (hrs)	250,000	
Dimensions (H x W x D, cm.)	56 x 9 x 60	
Weight	18kg	
LCD display		
Input	Voltage, current, frequency	
Output	Voltage, current, frequency	
Batteries	Voltage	
Log (events memory)	Last 200 events	
Communication		
RS232 port,	Yes	
Alarm and shutdown monitor	Yes	
SNMP link (optional)	Option	
Standards		
EMC emissions	IEC 62040-2; FCC part 15/B	
Safety	UL1778; IEC 62040-1-1	
Design	IEC 62040-3	
Low magnetic field radiation	EMF as per ICNIRP	
Batteries		
Type	Sealed, valve-regulated, lead-acid	
Number	32x7 Ah	
Voltage	12 V	
Backup time (min.)	6 at 50% load	
Recharge time (hrs.)	Appx. 1-2	
Battery cabinet		
Dimensions (H x W x D, in cm)	45 x 26 x 60	
Weight (kg)	90	

All specifications subject to change without notice.

For a full company profile, please visit out website at www.gamatronic.com.

Gamatronic Building, Jerusalem, Israel

Gamatronic's product range:

- UPS Systems
- Power systems for Telecom
- Dc-to-Ac Inverters
- Dc-to-Dc Converters
- Frequency Changers
- Battery Chargers
- Power Management Solutions

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